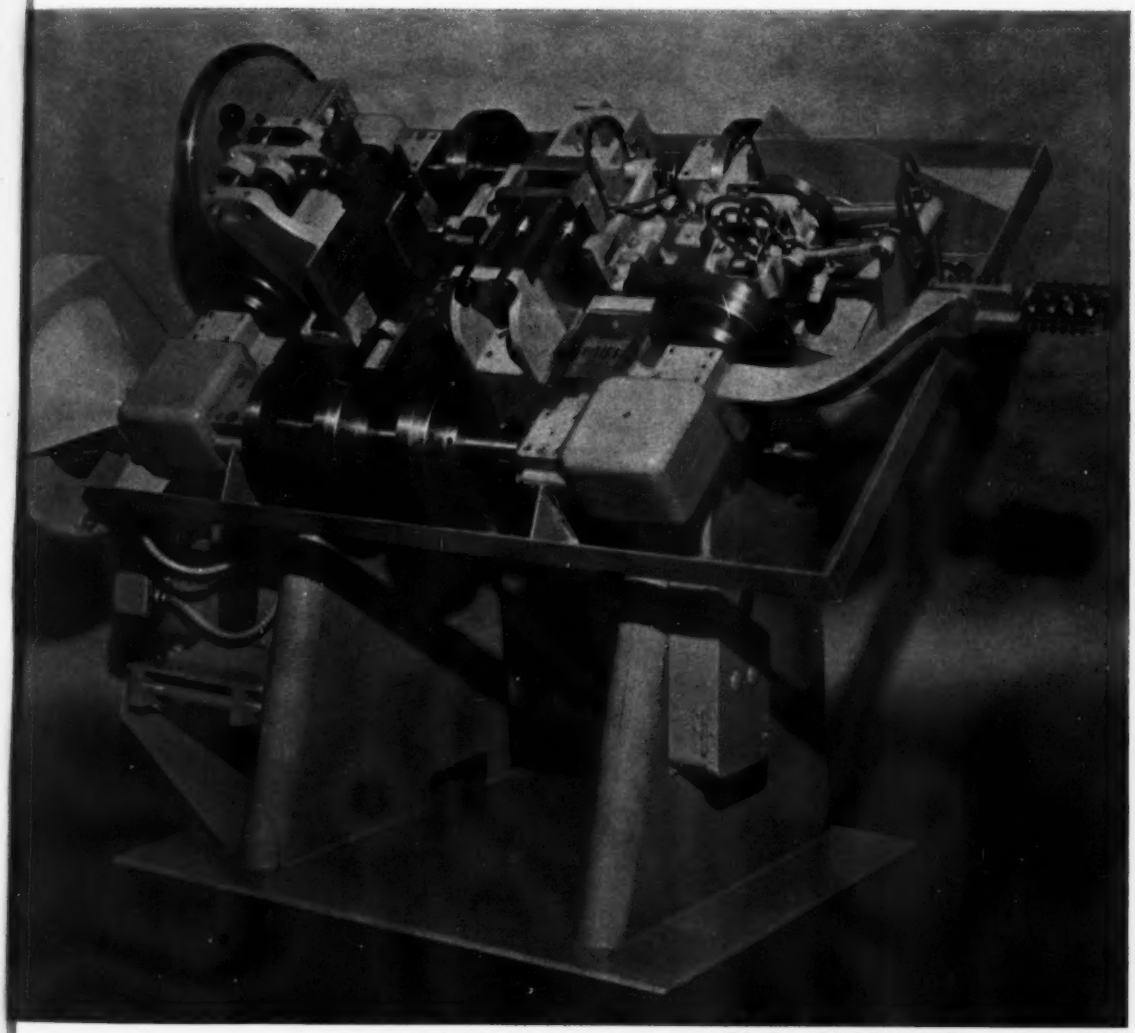
JULY 1960

TOOLING & PRODUCTION

The Magazine of Metal Working Methods



The First R-W-I Metal Former . . . page 52

Feeding a Swager, page 49
Fixture for Gear Generating, page 53
Hydraulically Equipped Dies, page 69

Complete Table of Contents
. . . Inside Cover

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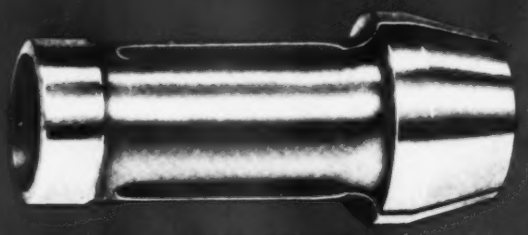

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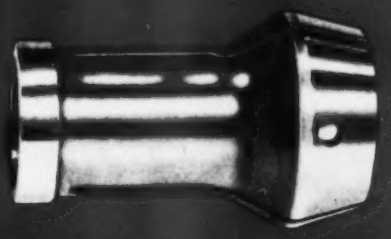

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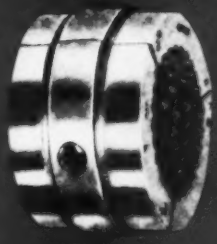

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CIRCLE INFORM-A-GRAM KEY NO. 2

TOOLING & PRODUCTION Magazine

VOL. XXVI, No. 4

JULY 1960

FEATURES IN THIS ISSUE:

The Inevitability of Automation 8
Talk of the Month by Harold A. Strickland, Jr.

Electrohydraulic Forming 43
Editorial by E. Willard Pennington

Manufacturing . . . in retrospect 45
A historical treat. Reproduction of a number of famous engravings depicting 18th Century manufacturing methods. Compare what you see with today's techniques.

Feeding a Rotary Swager: Last of a Series 49
by Keith Bernhardt
After you've chosen, tooled, and set up a swager, you must feed it. This discussion of feeding methods and principles concludes our series on rotary swaging by Mr. Bernhardt.

The First R-W-I Metal Former 52
The cover story.

Fixture Shows How Gears Are Generated 53
by M. E. Samuelson
Disclosure of a technique and fixture that Barber-Colman's been using for determining gear tooth form requirements.

Sub-Zero Temperatures . . . tools for material processing 62
by T. J. Frederick
How sub-zero temperatures ease the production of many of today's products, in many cases improving them and lowering costs.

Some Advantages of Hydraulically Equipped Dies . . 69
The use of hydraulic die cushions to ensure full required pressure from the start of the pad movement.

Six Heads Are Better Than One 72

Turn over for additional Contents . . .

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Drilling and Turning Fixture Designs **73**
by Federico Strasser

A round-up of three fixtures whose designs detail quick-clamping, equalized holding, and precision alignment.

Belt and Disc Finishing Can Be Quick and Handy **77**

Standard Rotary Pilot Bushing **77**

Roll Around Inspection **78**

Building Blocks Machine, Transfer New Rifle Part **82**

New Shape Cutting Machines Feature Unique Drive System **84**

DEPARTMENTS IN THIS ISSUE:

Personally Speaking 4

New Calling Cards 24

Man You Should Know....80

Catalogs — and other helpful literature 86

Product News 90

Cumulative Editorial Index 116

Advertisers' Index 118

Next month's T&P
Previews the Shows . . .

★ Machine Tool Exposition, 1960

★ Production Engineering Show

★ Coliseum Machinery Show

. . . Chicago, Sept. 6-16

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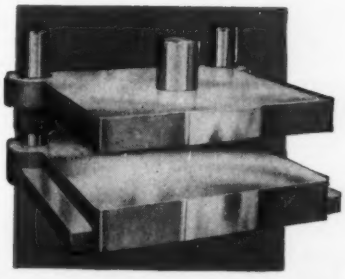

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CIRCLE INFORM-A-GRAM KEY NO. 4

JULY 1960
VOL. XXVI, No. 4
GEORGE J. HUEBNER, Founder
1885 - 1956

personally speaking...

Dear T & P Reader:

There is one Federal government service that touches virtually all American citizens. It's the postal service. And far too many Americans, including rank and file citizens, government officials and legislators, know far too little about it.

While the postal service is government operated, it is really a business. But, it is in a sad state as a business. It probably has more employees than any other organizational unit in the United States, private or public, except the Armed Forces. Imagine a business of such magnitude without one cent of capital. The intricacy and difficulty of planning and achieving modernization must be unbelievable.

Probably the worst aspect of the Post Office Department is that association with it means encountering such an absolute dead end that there is no incentive whatever for really bright, ingenious, young men of superior capability to join it on a career basis.

In recent years, there has been a continuous effort to increase rates and some of these efforts have been successful. It's true that there is a Post Office deficit every year. This results, of course, from expenses exceeding revenue. Deficits are offset by Congressional appropriation. Substantial portions of deficits result from handling franked mail, mail for charities at reduced rates, and other special services Congress asks the Post Office Department to perform without compensation.

Probably the least understood of anything is the Post Office bulk rate system. For example, third class rates are less than first class, not because this is a bargain offered by the Post Office, but because business which uses this kind of mail does a major portion of the Post Office's work before the material enters the mail. For example, third class requires no cancelling. It reaches the Post Office bundled according to official specifications for easy distribution. This may even mean sorting of the mail by postal zones. After all of this sorting, it's placed in bags which are labelled for a destination, so that the material goes clear through to the office of distribution before there is any handling of it by Post Office employees other than routing the bags to a railroad car or other transportation.

The Post Office Department complains continuously about inadequate rates for all classes of mail. I shudder to think what might happen in a large city Post Office some time if all business mail for one day were stamped instead of metered, thus requiring cancellation first and then individual piece-by-piece sorting. I'm sure this would quickly show that volume mailers have adopted every means available under postal regulations to minimize the amount of work required by postal employees.

This movement probably could be carried further if the Post Office Department could take positive, strong leadership in real modernization. Increased rates are not the answer. They only provide a temporary expedient. Our hope for better postal service is through modernization and the planning for it needs to be big in order to be ahead of demand instead of continuously 'way behind it. Greater interest in the Post Office Department on the part of all of its customers, I'm sure, could bring about the changes that are needed to make the postal service as efficient and as effective as it needs to be.

Cordially yours,

Ray Huebner

Publisher

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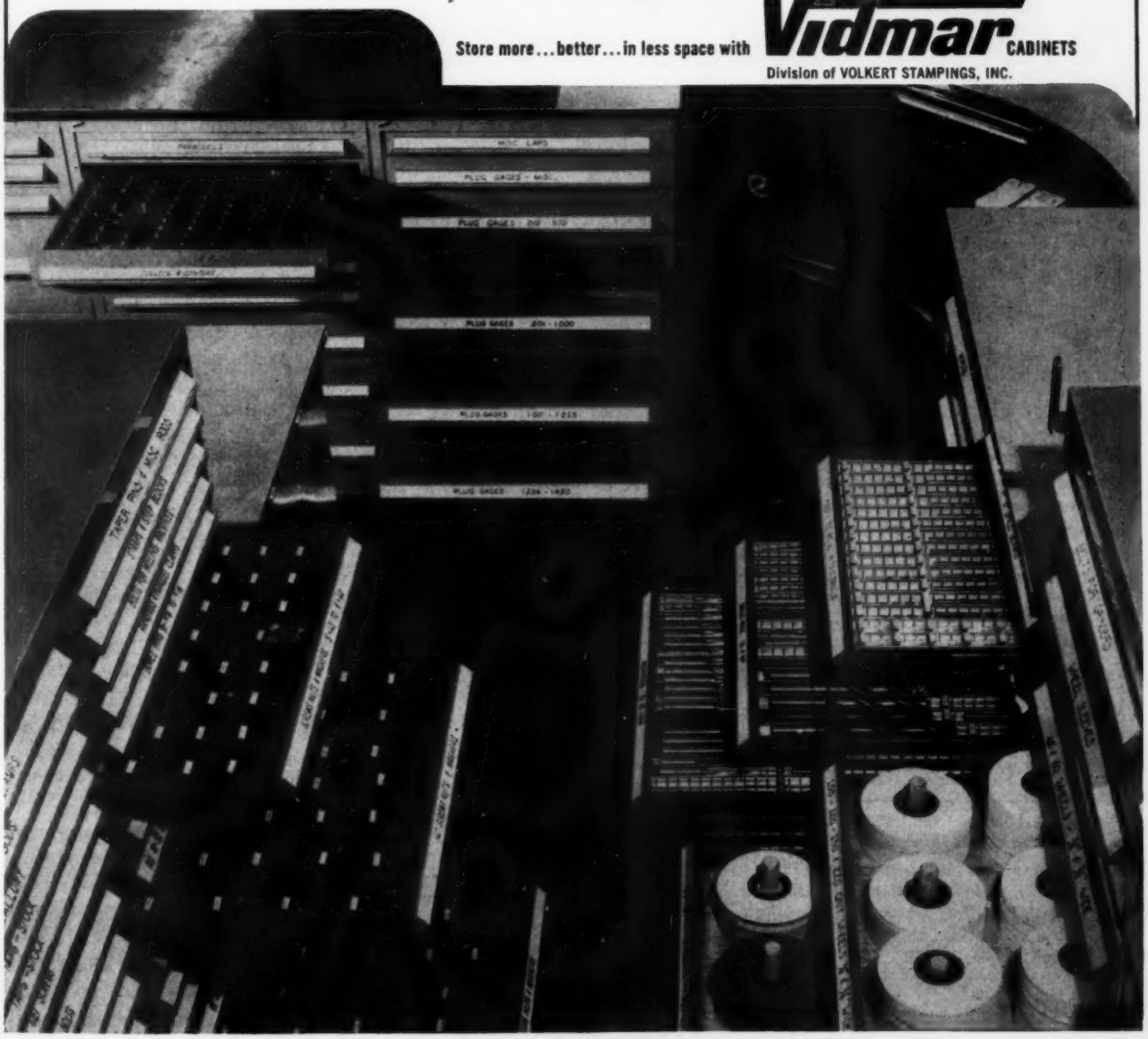

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This pivot is one of the larger parts Sperry assembles and inspects with B&L StereoZoom Microscopes.

How Sperry Saves Time with StereoZoom® Microscopes

In its work on the B-58 Hustler and Jupiter C missile programs alone, the Air Armament Division of Sperry Gyroscope Company makes over 250 different detail parts of floated gyroscopes and integrating accelerometers.

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CIRCLE INFORM-A-GRAM KEY NO. 8

Talk of the Month

The Inevitability of Automation

by Harold A. Strickland, Jr.

Mr. Strickland, vice president and general manager of General Electric's Industrial Electronics Div'n, presented this talk at the Fourth Conference on Manufacturing Automation, held earlier this year at Purdue University.

INEVITABILITY IMPLIES something that is about to come, or happen — something that cannot be avoided. Automation is not inevitable on either of these counts. First, because it is already here and, secondly, because a great deal of knowledge, understanding, and effort must be applied to accomplish further progress.

If proper and intelligent effort is put forth, the advance of automation *is* inevitable because it is one of the potent and available tools which can spur the economies of our western nations and thereby help us in our struggle to keep the world free.

We cannot afford to haggle over whether we will or will not use any tool which is compatible with our free enterprise system and which may well be a deciding factor in the east-west economic duel.

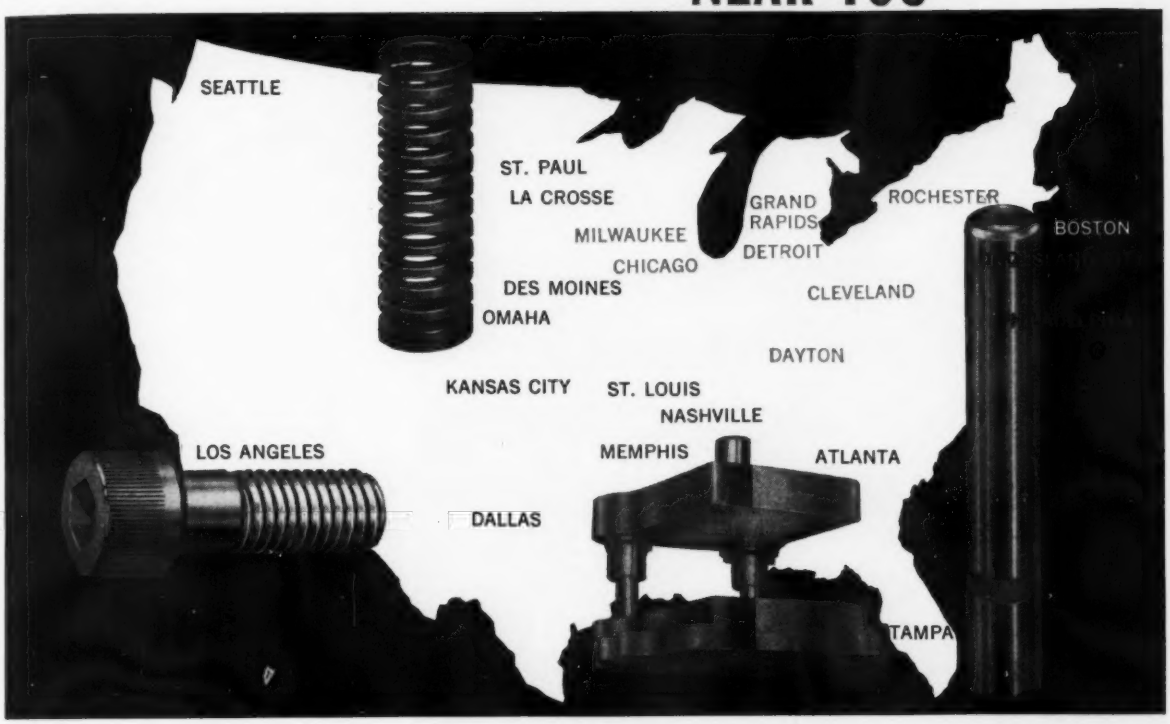
Management and labor are agreed that the economic challenge must be met. As George Meany, president of the AFL-CIO, recently stated to the press:

"In the final analysis there isn't anything under this system, with all its imperfections, that is good or bad for industry that isn't just about the same for labor."

We in the United States no longer have the choice of weapons;

. . . Continued on page 10

THERE'S A DANLY SUPPLIER NEAR YOU



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CIRCLE INFORM-A-GRAM KEY NO. 9

. . . Month's Talk from page 8

we must exploit *all* the weapons in our economic arsenal.

What is Automation?

For all its many definitions, automation is probably a contraction of the word "Automatization," which Webster defines as, "making into a thing regarded as capable of spontaneous motion or action."

The Greek roots are *auto,* meaning self, and *motos,* which means acting — or *mota,* which means thought. Thus, automation is the concept of things, self-acting, or self-thinking.

Perhaps we should more specifically say that: Automation is the concept of organizing and utilizing energy, machine elements, and information handling and control techniques to:

1. Accomplish physical and mental work with less contributed human effort; and to

2. Extend human capabilities.

Automation, then is a *concept;* it is not a product (although products are employed in its implementation). Predicting the ultimate extent of its application is like attempting, before the time of Edison, Watt, and Diesel, to predict today's market for energy conversion.

The concept of automation is not new. A Greek translation from 85 BC, referring to a water wheel of that day, philosophizes as follows:

"Cease from grinding, ye women who toil at the mill, sleep late, even if the crowing cocks announce the dawn. For Demeter (Greek goddess of agriculture) has ordered the nymphs to perform the work of your hands, and they, leaping down on the top of the wheel, turn its axle, which with its revolving spokes, runs the heavy concave Nysarian millstones. We taste again the joys of the primitive life, learning to feast on the products of Demeter without labor."

For 2,000 years automation has been making a contribution to a better way of life.

In the United States, automation has been a significant factor in our economic growth and in the attainment of high personal living standards.

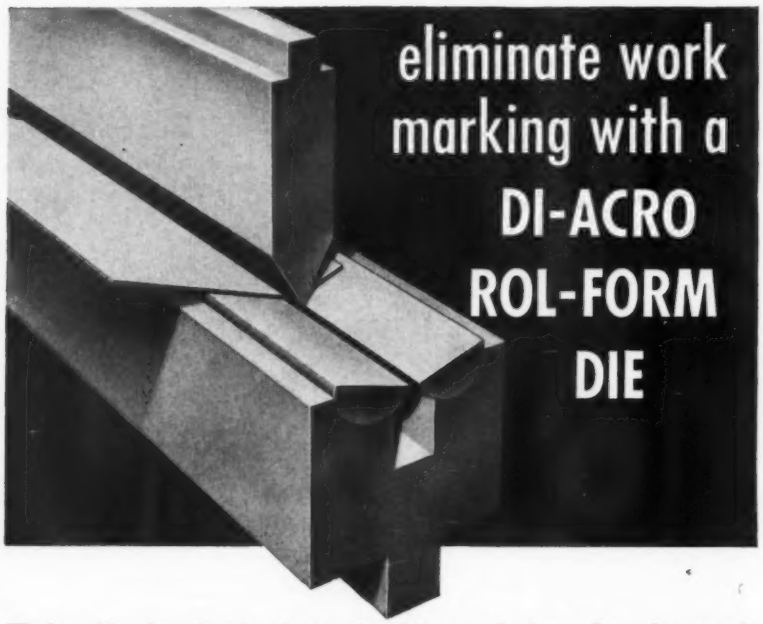
In fact, our recent concern over the competition of the Soviet Union, Western Europe, and Japan stems largely from the narrowing automation gap between them and us. They have recognized and are applying automation techniques as rapidly as possible, and the resulting impact is already evident.

Automation has contributed to our economic growth not only through increasing output, but by making possible whole new industries. Without automation such new industries as atomic power and rocketry would not exist as speeds, temperatures, and hazards involved are too extreme for human capabilities.

Automation, then, has not only provided us with a greater output of traditional goods and services, but has made it possible for us to have goods and services we could not otherwise have.

If we support this premise, that the automation concept is not new, what aspects constitute the modern "phase" of automation?

. . . Continued on page 12



Workmarking from forming sheet materials in press brakes and punch presses is greatly reduced and in many metals completely eliminated when formed with the Di-Acro Rol-Form Die. Hardened and Precision ground rolls pivot smoothly in the die block to fold material without strain. You save costs by discarding elaborate and time consuming preparation and work methods, reducing polishing time, eliminating scrap parts. You also cut costs in press brakes and punch presses by reducing the number of dies needed and reducing set-up time.

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The Rol-Form Die is offered in five styles and in lengths from 6 inches to 12 feet for use in all sizes and models of press brakes and punch presses.

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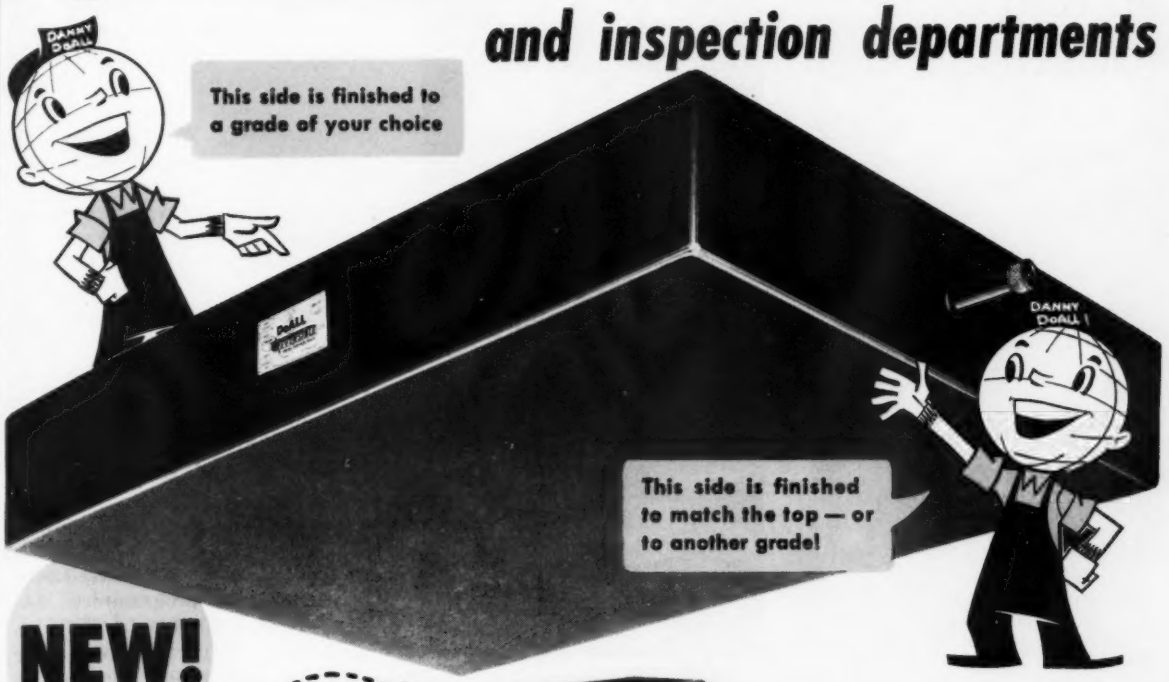
DoALL Announces . . . great news for setup and inspection departments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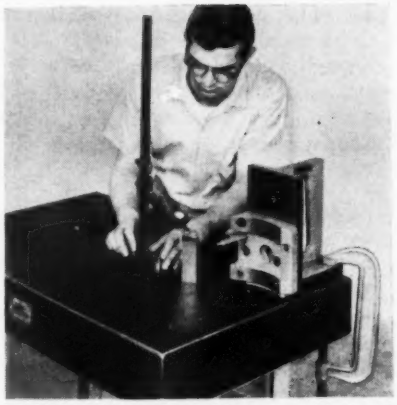
This side is finished to a grade of your choice
DANNY DoALL
This side is finished to match the top — or to another grade!

NEW! Double REVERSIBLE Faced BLACK GRANITE SURFACE PLATES



DoALL reversible surface plates are easily turned by standard bolts screwed into threaded inserts permanently imbedded in two sides. Fixture or work that must be held rigid is easily secured to the plate by a "C" clamp at any point along the periphery.

Here's a money-saving, time-saving, space-saving "first"—black granite surface plates finished on both faces. They're easily reversed by using inexpensive removable trunnions.

There's double usefulness in these new DoALL reversible surface plates. For example, one side can be used as a working surface while the reverse side is reserved for master inspection. Both sides can be lapped to the same grade or to any combination of standard grades—AA (laboratory), A (inspection) or B (shop). And you always have an extra plate that takes no extra space in reserve for emergencies.

DoALL reversible surface plates cost only one-third more than single-faced plates. This slight extra cost is more than offset by savings in freight charges, down time and the expense of having a plate reconditioned.

DoALL reversible plates are made from the same high-quality granite used for all other DoALL black granite products. They are extremely rigid, glare-free and harder than tool steel. There's no better granite for this purpose—anywhere.

Call your local DoALL Sales Engineer. He will gladly advise you on your black granite surface plates and accessory requirements.

During the Machine Tool Exposition, see DoALL's Demonstrations at the Coliseum, Navy Pier, Hall of Progress.

BG-5

Find Your DoALL STORE in The "Yellow Pages"

This is a typical DoALL Store

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CIRCLE INFORM-A-GRAM KEY NO. 11

STRIPPIT
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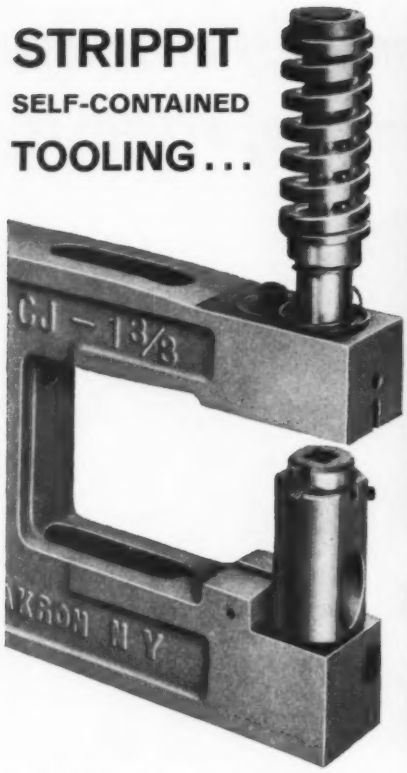


cuts costs 10 ways

1. no expensive custom dies—save all the time and cost involved in designing and building custom, single-purpose dies.

2. lower labor costs—no high-salaried tool and die makers are needed. Any good bench man can set up Strippit Tooling.

3. minimum tool investment—Strippit units can be kept in continuous use. You have no heavy investment in idle dies—no die storage problem.

4. shorter lead time—as soon as the pattern is ok'd, Strippit Tooling can be set up and put into production *immediately*.

5. faster, more accurate setups—Strippit units are self-contained, self-stripping and permanently aligned—bench-assembled on drilled templates, T-slotted plates or bed rails. Nothing is attached to the press ram. No need for die spotting and setting.

6. press downtime cut—as each run is completed a new Strippit setup is already waiting for the press. Self-contained design permits punch replacement in the press. Downtime is kept to a minimum.

7. unlimited versatility—Strippit units can be set up in any hole pattern and used over and over again—for long press runs or quick-change pilot runs—in stamping presses or press brakes.

8. a complete line from a single source—punching units with standard or special tooling, for punching up to ¾" mild steel—standard and special notching units for work up to ¼" mild steel.

9. nationwide sales and service—by trained tooling methods engineers in all major industrial areas. Manufacturing plants in Akron, N. Y., Los Angeles, Calif.; warehouse in Chicago, Ill.

10. specify "Strippit"—the original system of self-contained tooling. There are imitations but no substitute for Strippit engineering know-how, tested and proved designs and materials, first-class workmanship and the other advantages of doing business with a reputable organization that has been in business for 35 years.

FOR COMPLETE INFORMATION—write for the new Strippit General Catalog.

WALES **STRIPPIT** INC.

212 Buell Road • Akron, New York

In Canada: Strippit Tool & Machine Company, Brampton, Ontario

A UNIT OF HOUDAILLE INDUSTRIES, INC.

CIRCLE INFORM-A-GRAM KEY NO. 12

. . . Month's Talk from page 10

The new aspect of the automation concept lies largely in its ability to acquire and handle information rapidly and cheaply. We have moved the decimal point several places to the left in the cost of applying programmed logic and in communicating. We have substantially increased servo and sensor competences.

These new aspects of information handling concepts and tools, in theory, now enable us to integrate mechanization totally. We can now harness measurement to automatic control devices and to the complex logic of computers and thence to mechanical muscles of power driven machinery. Or, we can harness an information system to the ingredients of a business.

We can start with a description of a customer need, select or design its solution, check the warehouse for parts or stock, issue instructions to programmed machine tools, assemble the product, check out its performance, issue shipping and billing documents, and pay the employees — all automatically.

Of course, in practice, we have not yet combined all of these operations for a single business — but we will. The main reason we have not done it yet is because we don't understand the business well enough — not because we lack the technology.

Why Do We Need Automation?

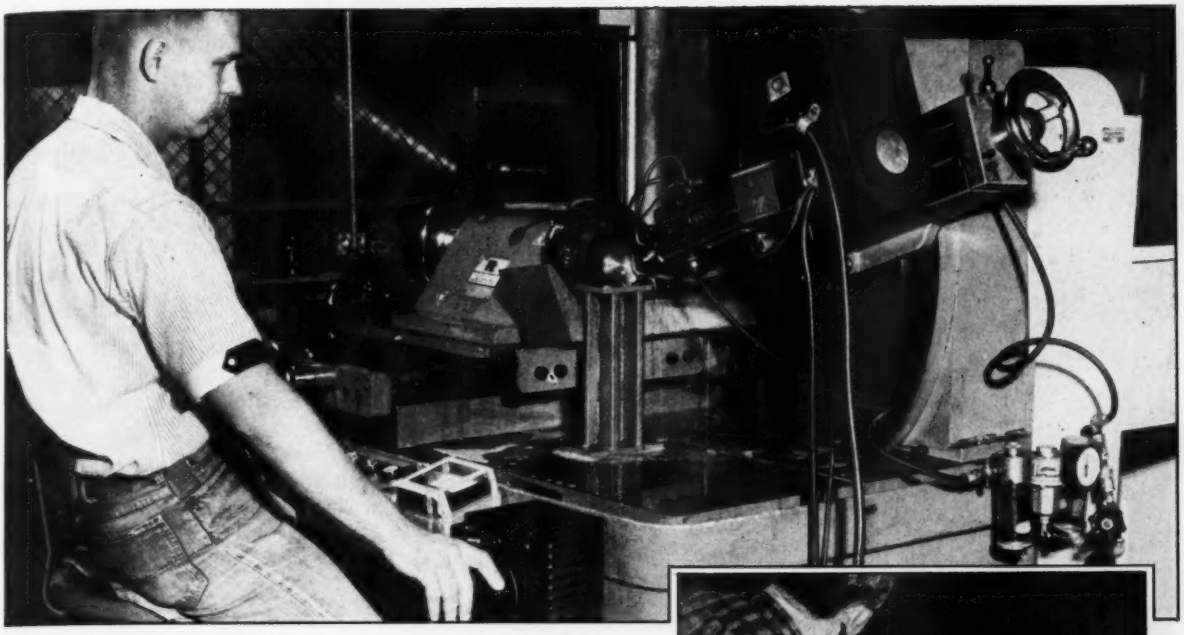
We need automation because the balance of world power today is tied to economic power. The business I have just described will provide flexible products and flexible production at mass produced prices. It will allow more rapid delivery, lower inventory, and better service with less overhead.

We in the United States must achieve a 4-5% annual gain in total output if we are to maintain or improve our standard of living and concurrently meet the demands of the future. This is about twice what we have been doing.

These demands include those of:

1. Our own rapidly growing population, which is starting work later, retiring earlier, and living longer and better.

. . . Continued on page 14



This special machine at Rocketdyne is designed so that angular adjustments of Bellows-Locke Drilling unit can be made in a vertical plane. Also visible is the Bellows Lubri-Air® Control unit (right) which cleans, lubricates and regulates the air supply.

This machine is similar to the one in the main illustration, except that the Bellows-Locke Drilling unit is mounted in a horizontal plane. Work-holding fixture also indexes on horizontal axis. Between the two machines, any angular relationship between two or more holes can be produced.

BELLOWS-LOCKE "Packaged" DRILLING UNITS

PROVIDE A DOWN-TO-EARTH SOLUTION FOR ROCKETDYNE'S SPACE-AGE PROBLEM

One of the most critical components of a liquid-propellant missile propulsion system is the fuel injector head, containing hundreds of very small holes, each of which must be highly accurate not only as to shape and size but also as to location, angle and finish. Because Rocketdyne, a Division of North American Aviation, Inc., is deeply involved in missile propulsion, both in the experimental phase and in the manufacture of engines which have reached the production stage, it must produce fuel injector heads in a wide variety of designs.

To meet the special demands of accuracy and flexibility, Rocketdyne engineers designed special drilling machines, incorporating Bellows-Locke Model 5-E Drilling units. These compact, versatile work units are completely self-contained, will operate at any angle in any plane, and feature a built-in valve controlling an adjustable air powered rapid advance and retract as well as an adjustable, precision hydraulic feed.

With the Bellows-Locke Drilling units, Rocketdyne holds tolerances to ± 0.0005 inch on holes less than 0.080 inch in diameter, while on holes that size and larger tolerances are held to ± 0.001. Center distances between holes are held to ± 0.003 inch. Commonly, two holes are drilled at an angle to intercept a vertical hole at a given point. The tolerance on this intercept is ± 0.001 inch and is held readily with the Bellows-Locke units.

Thousands of users have found the Bellows-Locke Model 5-E the ideal solution to their drilling problems. Chances are it can prove valuable to you, too. Write today for free Bulletin BL-5RA. Address Dept. TP-760, Bellows-Valvair, Akron 9, Ohio.

Bellows-Valvair

The Bellows Co. • *Valvair Corp.* *Akron 9, Ohio*

DIVISIONS OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

784-C

CIRCLE INFORM-A-GRAM KEY NO. 13

MEIER WEARITE®
extruded aluminum bronze

** for wear plates, strike plates, wear strips, ways and gibs, cam slides, lathe beds, wipers for roll forming.*

QUALITY: WEARITE is produced under strict laboratory controls. Tough (210–307 Brinell); strong (105,000 psi ultimate tensile); and smooth surfaces with excellent wear characteristics.

SIZE: 97 different rectangular sizes 1/4" to 3" thick and 1" to 6" wide.

MACHINING: Extruded WEARITE is free from porosity, and inclusions and has a homogeneous structure, improving machineability.

COST: MEIER WEARITE COSTS LESS in pound for pound of usable metal than cast wear strips.

Write for technical folder or test sample at no cost.

Meier BRASS & ALUMINUM Company

1471 E. NINE MILE RD.
HAZEL PARK MICH.

CIRCLE INFORM-A-GRAM KEY NO. 14

. . . Month's Talk from page 12

2. Our continuing defense requirements.

3. The need to continue the expansion of scientific research to assure future economic growth and free world survival.

4. Our obligations to hundreds of millions of humans in underdeveloped nations. These nations are now beginning the industrialization process and will, we hope, on the basis of example and assistance, make their choice for a free society.

The essential economic growth to provide for these needs can only be attained through gains in total output.

The need for continuing increase in output is not only domestic. More than half of the free world economy is represented by the U.S. and everything we do affects the rest of the free world. We can no longer consider ourselves an exclusively "domestic" economy.

As in the past, our ability to satisfy such growing needs will stem from our ability to innovate. *Continual* innovation is essential to *continual* economic growth. One of the significant innovations of this era is the new capability provided by the concept of automation.

Major Roadblocks

The progress of automation must be inevitable, but there are roadblocks, both physical and psychological, which must be removed before optimum economic gain can be realized.

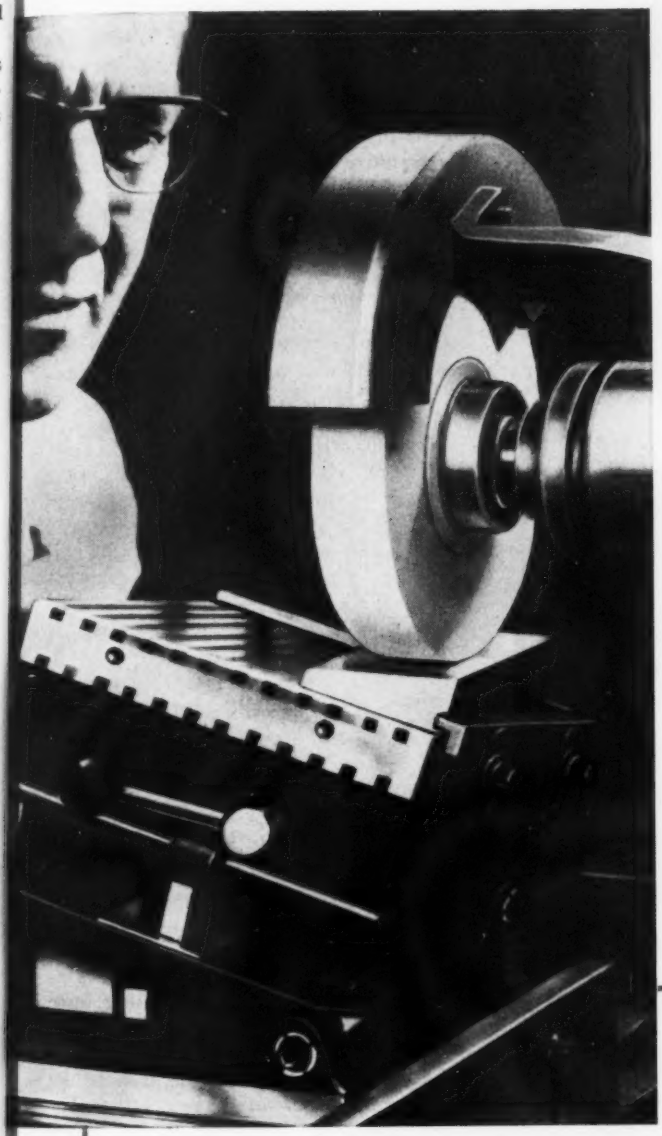
First, we lack sufficient knowledge and understanding of many production and management processes. We cannot automate what we do not understand.

Many processes and operations are still "art," rather than science. Many potential automation users do not really know what occurs between the operation input and output.

In many instances, we who are considering automating do not have a clear understanding of our objectives. If an entire business is to be automated, objectives must be defined and the whole business re-thought — the products themselves and product relationships, the market, and the distribution

. . . Continued on page 16

NOW—SINE PLATES FROM EX-CELL-O!



EX-CELL-O ADDS ROBBINS MAGNA-SINE TO LINE OF PRECISION GAGE AND INSPECTION EQUIPMENT

Magna-Sine and non-magnetic sine plates, formerly manufactured by the Omer E. Robbins Company, are now part of the famous Ex-Cell-O line of precision inspection, gaging, and machining equipment.

With Ex-Cell-O Magna-Sine you set up any angle, single or compound, right or left hand, without V-blocks, angle plates, or complicated "build-ups". Just select the proper gage blocks, place them between the base and roll bar swivel block, flip the locking device . . . and you're ready to go! And Ex-Cell-O Magna-Sine holds work securely—without clamps—by the most powerful holding force ever built into a permanent chuck magnet.

Ex-Cell-O sine plates are available in a complete range of sizes and models, magnetic and non-magnetic, for every machining and inspection operation.

The Machine Tool Exposition—1960

•

See Ex-Cell-O In Booth 946

MMT-PE

New Ex-Cell-O 90° Indicator Gage

For faster, easier, precision checking of squareness, use the new Ex-Cell-O 90° Indicator Gage—plus or minus accuracy to .0001" is instantly registered on its dial gage. Surfaces up to 17¾" long can be checked with each reading. Also, when used with Ex-Cell-O precision sine plates, this time-saving indicator gage will quickly measure the accuracy of angles other than 90°.

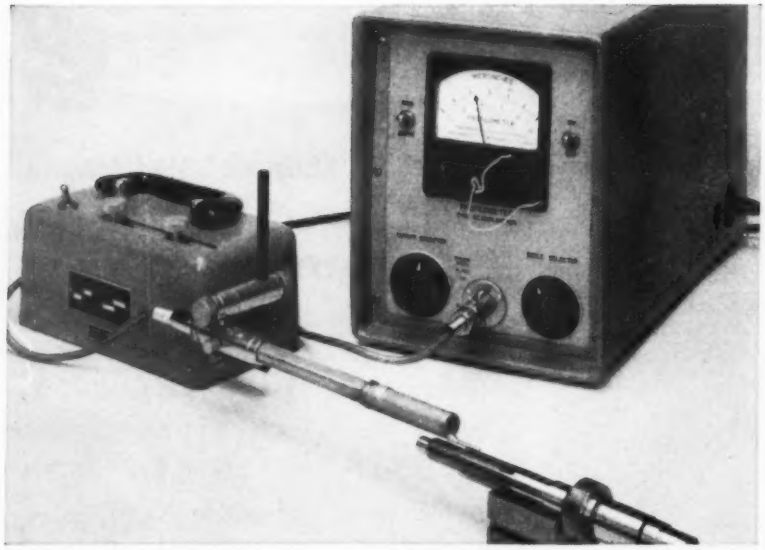
EX-CELL-O FOR PRECISION

Machinery Division

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING & BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • TORQUE ACTUATORS • CONTOUR PROJECTORS • GAGES AND GAGING EQUIPMENT • GRANITE SURFACE PLATES • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • ATOMIC ENERGY EQUIPMENT • DAIRY AND OTHER PACKAGING EQUIPMENT

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN 60-51

CIRCLE INFORM-A-GRAM KEY NO. 15



PERTINENT QUESTION:

WHEN do you need the Profilometer®?

FACTUAL ANSWER:

Whenever you must precisely *know* the roughness of *any* production surface — quickly, dependably, in microinches (arithmetical or rms).

FREE BULLETIN LT14 gives details — describes cost-saving applications. May we send you a copy?

MICROMETRICAL MMC MANUFACTURING COMPANY
345 S. MAIN ST. ANN ARBOR 8, MICHIGAN

Manufacturer of the PROFILOMETER®, PROFICORDER®, MICROCORDER®, WAVOMETER®, ANDEROMETER®, VAROMETER®, CHART VIEWER • Exclusive American Sales Agent for CENSOR Dimensional Gaging and Sorting Equipment

CIRCLE INFORM-A-GRAM KEY NO. 16

. . . Month's Talk from page 14

methods.

It is frequently a mistake to attempt to automate what is currently being done.

The sewing machine, the centrifugal pump, and the rotary saw were possible only after the purpose of the operation and the desired result were determined. It proved impractical to try to mechanize the older manual methods directly.

Secondly, the economic feasibility in many applications has not been proven. Our technical ability to automate exceeds our ability to prove economic feasibility. We must, therefore, convert technical solutions to economic solutions. This points up an entrepreneurial opportunity to today's managers: To both recognize the opportunity and risk his resources to assure substantial progress of automation.

The area of high speed repetitive paper work has been, to date, the most common application of the new automation concept.

Opportunities for automation are vastly more extensive, but we must prove the value of broader application. This is a kind of bootstrap-lifting process for the chances are that we don't know the cost of the present methods either. We may also have to adjust our accounting methods — for instance, applying overhead as a percentage to direct labor has no significance in many highly automated operations.

Thirdly, the problem of personnel training and re-training must be solved. We must assure a work force competent to implement new operating methods and techniques. This will involve re-training programs for some of those in our current work force and appropriate changes in our educational system to properly train the next generation to meet the new needs of society and industry.

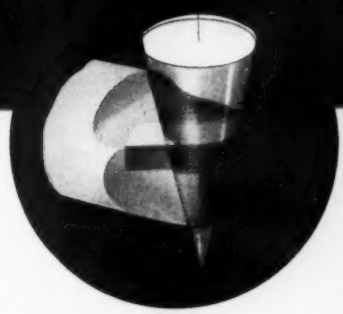
Fourthly, a concerted effort is needed to help people overcome their traditional psychological resistance to change and fear of the new. This general resistance to change has been fortified by our belief that continued economic growth, higher living standards, and free world survival are in-

. . . Continued on page 21

NEW FROM **FAIR STREET** • HOME OF MICROBORE

titanium carbide and ceramic tipped microbore adjustable tooling!

Minimum overhang between cutting tip and cone seat assembly reduces deflection, assures extended tool life.



Cone relief has uniform clearance around profile of cutting edge for maximum tool life.

Cone Relief Ground Like All Microbore Tips!

High cutting speeds! Microbore titanium carbide and ceramic tips cut at speeds and feeds impossible with any other type tips, yielding excellent surface finish . . . in some instances comparable to ground finish. Micrometer vernier adjustment sets the tool point in seconds to accurate part dimensions. Extreme rigidity of basic design, double cone bearing and axial locking force; plus minimum tool point overhang, makes Microbore ideal for these new cutting edges. *Like all Microbore cutting tools, the new tips are cone relief ground to gage room accuracy.* Microbore titanium carbide and ceramic tipped tooling are major developments in the complete Microbore system of precision cutting tools.

Ask your Microbore distributor for complete information or write for Microbore catalog.

DeVlieg® Microbore® System

DEVLIEG MICROBORE • DIVISION OF DEVLIEG MACHINE COMPANY

Fair Street · Royal Oak, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 17

INVOLUTE GEARS

FELLOWS G

NON-INVOLUTE PARTS

Fellows
4GS Gear Shaper

S GEAR SHAPERS DO DOUBLE DUTY

Fellows Gear Shapers are not limited to the production of gears alone. They are valuable production machines ideal for the manufacture of *many* types of parts, of both involute and non-involute form.

As gear shapers, they provide high production rates in the manufacture of internal and external spur and helical gears. As general purpose production machines, they also make possible the economical production of irregularly shaped parts . . . in many cases doing in one simple operation what would require several operations using conventional shop tools.

If you manufacture gears in your plant, chances are the Fellows Gear Shaper is already an important part of your production process. If you manufacture irregularly shaped parts, find out how the Fellows Gear Shaper can help you increase production and cut costs.

Your Fellows representative will be happy to give you further information on the complete line of Fellows production and inspection equipment. Ask him, or write direct.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont, U.S.A.
Branch Offices:
1048 North Woodward Ave., Royal Oak, Mich.
150 West Pleasant Ave., Maywood, N.J.
5835 West North Avenue, Chicago 39
6214 West Manchester Ave., Los Angeles 45

THE PRECISION LINE

Fellows *Gear Production Equipment*

CIRCLE INFORM-A-GRAM KEY NO. 19

DEPENDABLE . . . predictable response to heat treatment every time

Send for Bulletin 102— "Helpful Heat-Treating Hints."

The full uniformity within each bar of Desegatized FM die steel and the consistent uniformity from lot to lot simplifies the heat treatment of your die components. Predictable hardnesses are readily attainable . . . distortion and size change are minimized . . . danger of cracking is lessened!

In free machining FM die steels, full uniformity is achieved through Latrobe's unique Desegatized process of manufacture. This process guarantees an even distribution of carbide particles, free machining alloy sulphides and other alloying elements . . . factors leading to improved machinability, greater toughness and improved wear resistance in addition to the optimum heat-treating characteristics.

Latrobe's 12% chromium FM die steels are available through district steel service centers near you. Grades include: Olympic FM (Type D-2) for long-run applications; GSN FM (Type D-3) non-deforming die steel; Cobalt Chrome FM (Type D-5) for extra resistance to galling and pickup.

Call your Latrobe representative today!

Manufactured by skilled American labor

LATROBE
Metalmasters

LATROBE STEEL COMPANY
LATROBE, PENNSYLVANIA

BRANCH OFFICES and STEEL SERVICE CENTERS: BOSTON • BUFFALO • CHICAGO CLEVELAND • DAYTON • DETROIT • HARTFORD • LOS ANGELES • MIAMI • MILWAUKEE NEW YORK • PHILADELPHIA • PITTSBURGH • SAN LEANDRO • TOLEDO

CIRCLE INFORM-A-GRAM KEY NO. 20

. . . Month's Talk from page 16

evitable. We must recognize the fact that our industrial and economic superiority can no longer be taken for granted.

A history of success has beguiled us as a people into complacency. Until most recently, it has been very difficult for us to account for the superiority of any other people in any field — except in terms of treason.

President Eisenhower, at the NATO meeting in Paris, mentioned three significant popular misconceptions held by the American people:

1. "That our free system was inherently more productive in all fields than the totalitarian system."

2. "That time has always been on our side, irrespective of what we do with that time."

3. "That triumph of freedom over despotism is inevitable."

In summary, then, if we are to live in the future, as we hope, the progress of the automation concept is inevitable.

Just as generations before us have met their problems and their challenges through ingenious application of available knowledge, coupled with unending efforts to expend that knowledge, so shall we.

As a nation, we realize what a tremendous and vital task we have before us. We cannot afford to neglect any of our productive tools.

There are definite roadblocks to the rapid achievement of wide application of the automation concept but I see them as challenges not as immovable obstacles. I can only say, "It takes a lot of hard work and sacrifice by a lot of people to bring about the inevitable."

PROTECT YOUR FUTURE

BUY U.S. SAVINGS BONDS TODAY!

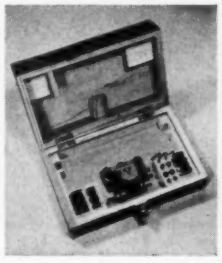
See your Paymaster about the payroll deduction plan.

PRECISION PRODUCTION PROBLEMS?

Here's help from Bausch & Lomb in TOOL DESIGN INSPECTION FABRICATION MEASURING TESTING

TOOLMAKERS' MEASURING MICROSCOPE

Quickly measures transparent or opaque objects of any contour. Linear, accurate to 0.0001"; angular, to 1 minute of arc.

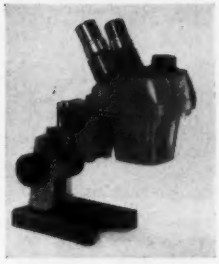


NEW UNIVERSAL STAGING FIXTURE

Positions small parts for critical measurement with B&L Bench Comparator and Toolmakers' Microscope. Auxiliary base, with 7" travel, increases range beyond that of measuring stage.

STEREOZOOM* MICROSCOPES

Magnified 3-D views of tiny parts. Dustproof, shockproof, can be mounted right in machine or fixture. Speeds assembly, inspection. Most complete line, widest field of view.



BENCH COMPARATOR

Exclusive under-stage illumination—no complex set-ups, no holding fixtures for most work. Magnified silhouettes, show errors instantly. Reads to 0.0001" with optional micrometer stage.

OPTICAL AIDS CATALOG

Time-and-money-saving data on Surface Comparators, Industrial Magnifiers, Macroscopes, Micrometer Discs, Brinell Microscopes, Microscope Bodies, Wide Field Tubes, Shop Microscopes.

NEW SCRATCH-DEPTH GAGE

With this simple hand-held instrument you can measure the depth of any scratch to 0.0001", with a range of 0" to 0.015"

*TRADEMARK, BAUSCH & LOMB

MAIL COUPON TODAY FOR VALUABLE DATA

BAUSCH & LOMB
79707 Bausch St., Rochester 2, N. Y.

Please send literature on optical production aids checked below:
☐ Toolmakers' Microscope ☐ Scratch-Depth Gage ☐ Bench Comparator ☐ Optical Aids Catalog ☐ StereoZoom* Microscopes ☐ Universal Staging Fixture.

NAME .....
TITLE .....
COMPANY .....
ADDRESS .....
CITY ..... ZONE ..... STATE .....

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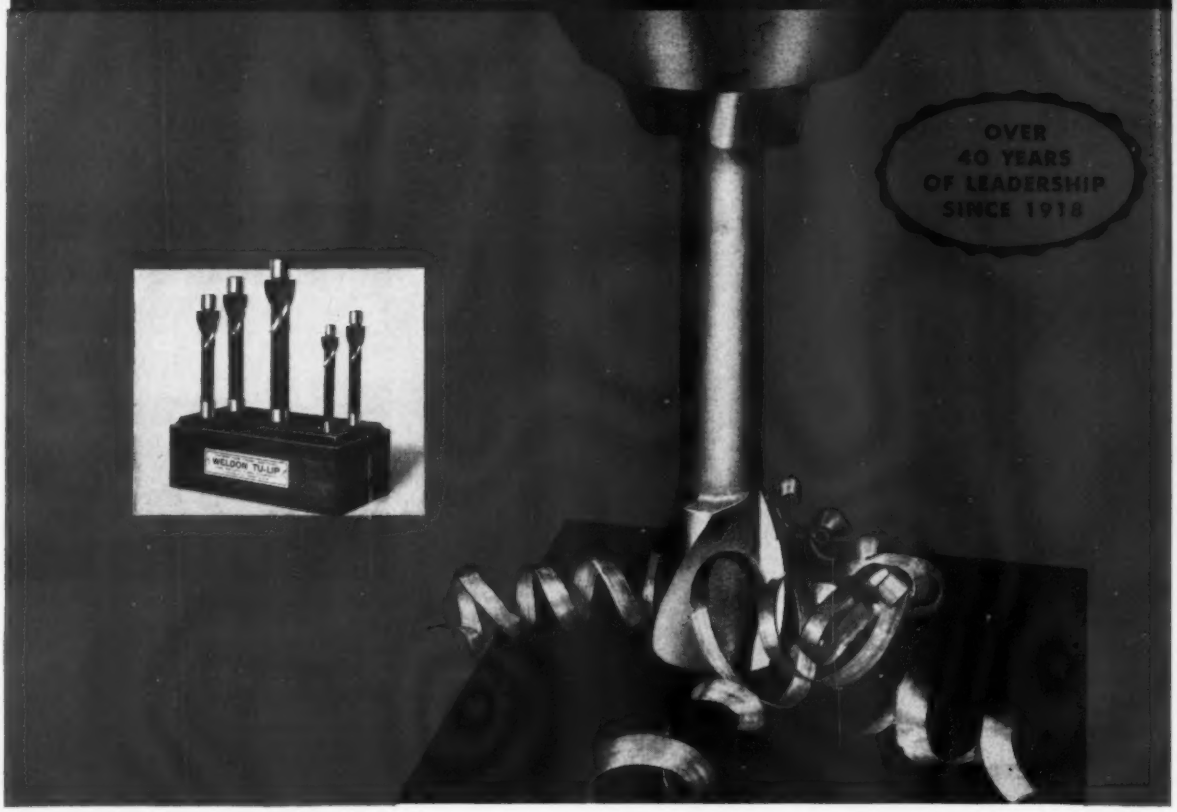
SINCE B&L 1853

CIRCLE INFORM-A-GRAM KEY NO. 21

YESTERDAY'S PIONEER . . . TODAY'S LEADER



WELDON "TU-LIP" COUNTERBORES FOR FAST, FREE CUTTING

As the name implies, WELDON "Tu-Lip" counterbores have only two cutting lips or flutes. This feature, together with the fast spiral, makes the "Tu-Lip" the fastest, freest cutting counterbore on the market.

Breakage due to clogging is prevented because this improved cutting tool provides more than ample chip room. Furnished singly in sizes desired or in convenient wood block sets as illustrated.

Catalog list numbers are now marked on all Weldon tools and holders as an aid when reordering . . . another WELDON FIRST.

Weldon distributors throughout U. S. A. and Canada carry complete stocks to serve you.

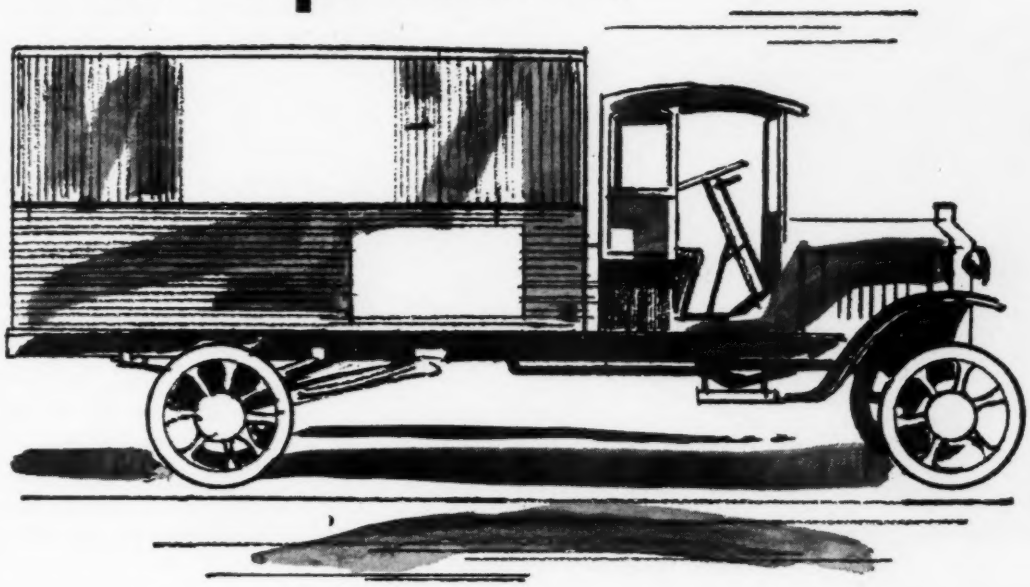
WRITE FOR FURTHER DETAILS TU6

THE WELDON TOOL COMPANY

3000 WOODHILL ROAD · · · CLEVELAND 4, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 22

Delivering lo$t profit$?



You can't afford to deliver your goods in obsolete equipment; that would be poor economy and tough on your name.

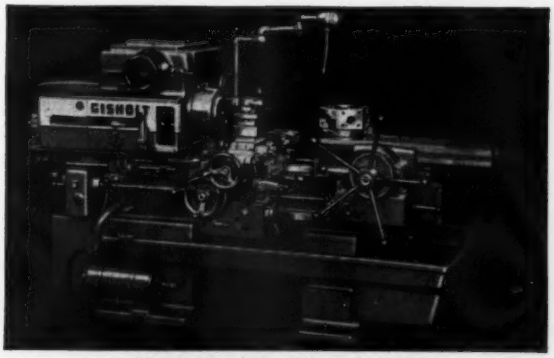
But what about obsolete production equipment? It's out of sight, but it delivers a far greater loss in wasted time and manpower, excessive unit costs and reduced quality.

You might be surprised how easy it is to turn these losses into profits with the many production advantages of a modern Gisholt Turret Lathe.

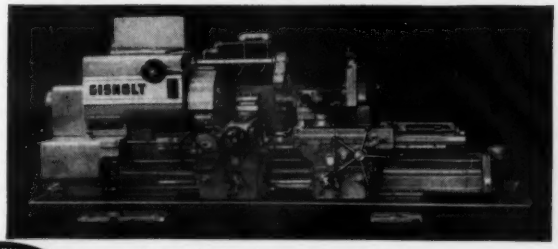
Here is the capacity with the versatility you need to cut critical unit costs on a wide variety of tough jobs. Here is the easy operation you need with the easy setup to minimize tooling and change-over time. Here is the extreme accuracy you need to maintain closest tolerances and highest quality. Here is the extra power with the rigidity to take full advantage of modern cutting tools.

Here are all the advantages you need to keep ahead of demands for higher, faster production and lower costs.

Ask your Gisholt Representative about Gisholt Ram and Saddle Type Turret Lathes—how they can be put to work in your plant earning extra profits, paying for themselves. Call him today or write for literature.



Gisholt Ram Type Turret Lathe



Gisholt Saddle Type Turret Lathe

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

Investigate Gisholt's Extended Payment and Leasing Plans

MMT=PE

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Machines
• *Factory-Rebuilt Machines with New Machine Guarantee*

CIRCLE INFORM-A-GRAM KEY NO. 23

interchangeable with all standard JIC cylinders

With the introduction of the ALL NEW T-J Squair Head, Tomkins-Johnson now offers industry the most complete design range of air and hydraulic cylinders. Presently available in bore diameters from 1-½ to 8 inches, the T-J Squair Head is an interchangeable cylinder which produces maximum force and efficiency, with minimum pressures . . . and is also adaptable to the use of low pressure oil as the working medium. Write today to The Tomkins-Johnson Co., Jackson, Michigan, for Bulletin #SQ 10-58 and complete details.

CHECK THESE 10 POINTS OF T-J SUPERIORITY

1. One Piece Piston
2. Hard Chrome Cylinder Bore and Piston Rods
3. High Tensile Steel Tie-Rods
4. Cushion Adjusting Screw, Externally Adjustable
5. New Super-Cushion for air, or Self-Aligning Master Seal for oil (T-J Patents)
6. Solid Steel Heads and Mounting Plates Standard all Models
7. Port Design Allows Minimum Pressure Drop on Inlet or Outlet
8. Chevron Type, Self-Adjusting Rod Packing
9. Piloted Packing Gland—Absolute Alignment
10. Piston Rod, Extra Strong—Polished and Chrome Plated for Efficiency and Protection

T-J TOMKINS-JOHNSON
RIVITORS . . . AIR AND HYDRAULIC CYLINDERS . . . CUTTERS . . . CLINCHORS

CIRCLE INFORM-A-GRAM KEY NO. 24

The **Abrasives Div'n of Elgin National Watch Company** has appointed **Kevin Knowles** as field engineer to handle Elgiloy, patented cobalt nickel spring alloy, on the West Coast, with headquarters in Los Angeles.

Announcement was made recently of the appointment of **Ira R. Ogilvie** as advertising manager for the **Merkle-Korff Gear Company.** He was formerly with the George Gorton Machine Company.

Thomas E. Murphy has been named assistant manager, tool steel sales, by **The Carpenter Steel Co.**

William C. Heard is now vice president, sales, for the **Capewell Manufacturing Company.**

D. E. Wetzel has been named sales representative by **Armstrong Bros. Tool Co.** He will headquarter in St. Louis.

Ray Nixon has joined **R-O Manufacturing Co.** as assistant sales director.

Owatonna Tool Company has appointed **James E. Braas** industrial sales manager.

Robert K. Warren is now vice president of sales, steel division, **Firth Sterling Inc.,** and **John S. Roller,** previous sales executive, is now assistant to the president.

Robert H. Hamilton has been named field engineer for Delaware, Maryland, southeastern Pennsylvania, Virginia, and the District of Columbia, for **Denison Engineering Div'n, American Brake Shoe Company.**

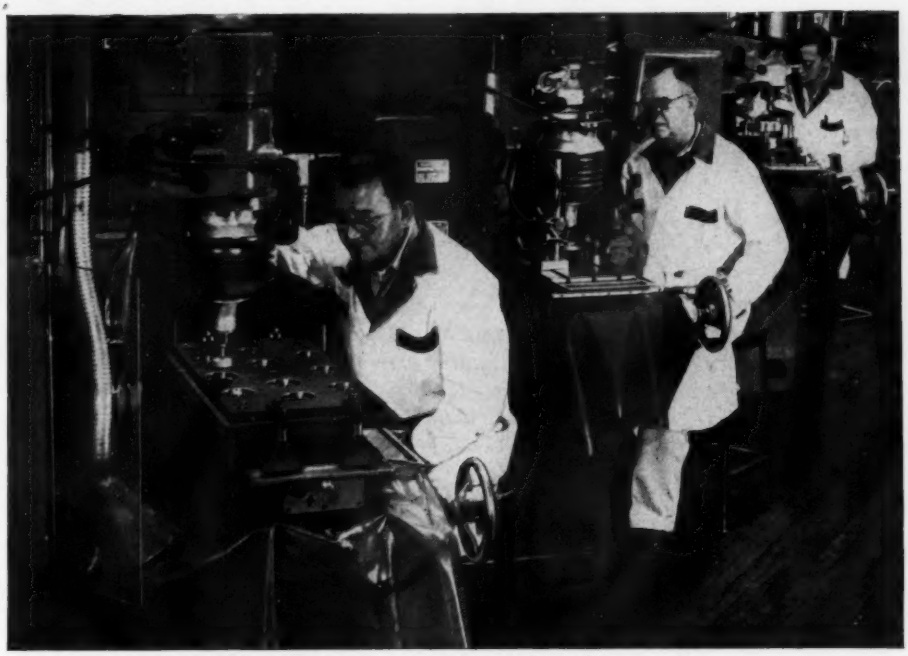
Newly promoted eastern manager for **American Drill Bushing Company** is **John S. Richard, Jr.**

The Heald Machine Company has appointed **Hartwell G. Howe** as vice president and general manager, succeeding **Carl M. Beach,** who is returning to **Cincinnati Milling Machine Company,** the parent firm.

Val Koller tells why he continually adds more Moore Jig Borers and Jig Grinders to his team

This is another in a series featuring the views of owners of leading tool and die companies.

by **VAL KOLLER**
President
Koller Die & Tool Co.,
Milwaukee, Wisconsin
Manufacturer of Dies
and Metal Stampings—
Tools—Jigs—
Fixtures and Gages—
Special Machines



Moore equipment in Koller plant, with new #3 Jig Grinder in foreground.

"Since our foundation in 1919 it has been my personal objective to strive for perfection. Since that time perfection has evolved into a .000010" word for tool and die makers. Such precision is rapidly becoming common-place... particularly in electronics and guided missile fields of production. With the installation of Moore equipment in 1950, we have been able to compete successfully in a caliber of work that before was not possible.

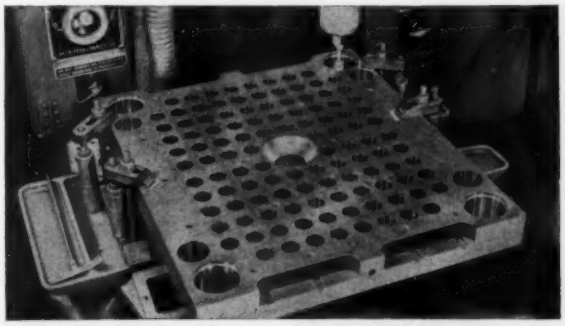
"Since that initial investment in a Moore Jig Grinder we have continually added Moore teammates to our toolroom. Today we operate more Moore equipment than any other top contract shop in the greater Milwaukee area.

"The tolerances and intricate contours now required make Moore Jig Borers and Jig Grinders a must in each toolroom. These machines operate at full capacity each workday with negative downtime due to mechanical failures. In fact, we have found that it costs real dollars and cents to operate *without* Moore equipment.

"This cost factor is just one of many reasons why we recently added another teammate to our toolroom ...the new Moore Model #3 Jig Grinder. This machine, with its tenth-splitting accuracy, hardened ways and wider range, enables us to service more customers better."

Write today for literature describing the unique features of #3 Moore Jig Borers and Jig Grinders or see our catalog in SWEET'S MACHINE TOOL FILE.

MOORE SPECIAL TOOL COMPANY, INC.
726 Union Avenue, Bridgeport, Connecticut



This 116 cavity mold plate was completely jig ground at Koller on a Moore Jig Grinder. Tolerances: hole location ± .0001", hole diameter ± .0001".

HOLES, CONTOURS AND SURFACES, tells how to produce tools and dies *the modern way*.
424 pages,
495 illustrations.
$5 in U.S.A.
$6 elsewhere.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

CIRCLE INFORM-A-GRAM KEY NO. 25

Thor

Everything you want in Torque Control···

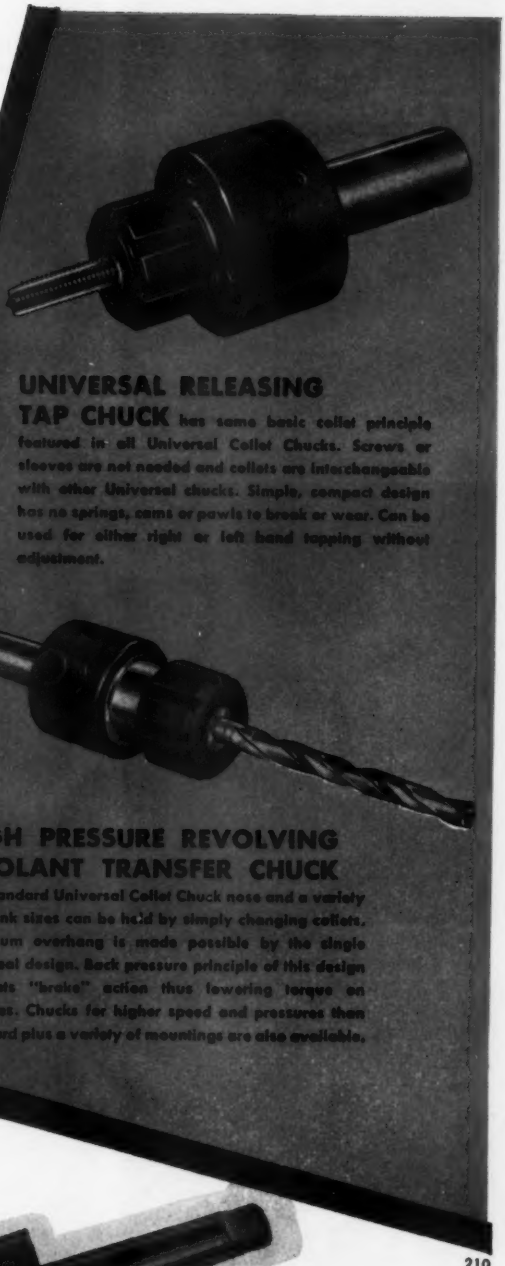
and more!

Thor Uni-Tork screwdrivers and nut setters make torque control of threaded fasteners as simple as turning on a light. Operator judgment and guesswork is gone. Uni-Tork snaps out of engagement when desired torque is reached, snaps in again when applied to the work. Thor Uni-Tork air tools have external torque adjustments from 10 to 100 inch-pounds. Available on all Thor air screwdrivers and nut setters and on Thor electric tools. Your Thor factory representative or distributor will show you the tools that think for themselves. Thor Power Tool Company, Aurora, Illinois. Branches in all principal cities.

Thor POWER TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 26

UNIVERSAL BORING CHUCK is heavy and rigid for all types of rough boring without chatter yet accuracy of adjustment adapts it equally well to finish boring. Time-tested Universal Collet nose holds boring tool much more rigidly and securely than set screws while precision and extreme accuracy of feed-adjustment are obtained by an anti-backlash arrangement of feed screw and large dial.



UNIVERSAL RELEASING TAP CHUCK has same basic collet principle featured in all Universal Collet Chucks. Screws or sleeves are not needed and collets are interchangeable with other Universal chucks. Simple, compact design has no springs, cams or pawls to break or wear. Can be used for either right or left hand tapping without adjustment.

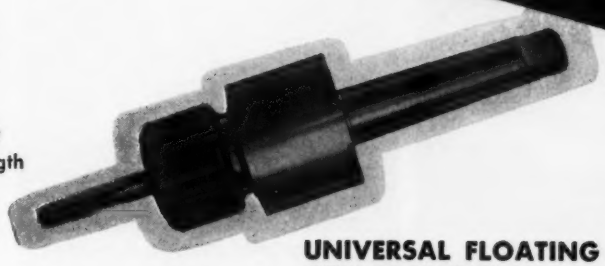
HIGH PRESSURE REVOLVING COOLANT TRANSFER CHUCK has standard Universal Collet Chuck nose and a variety of shank sizes can be had by simply changing collets. Minimum overhang is made possible by the single face seal design. Back pressure principle of this design prevents "brake" action thus lowering torque on spindles. Chucks for higher speed and pressures than standard plus a variety of mountings are also available.

UNIVERSAL
COLLET CHUCKS

combine maximum holding power and minimum run out with simplicity of design and low price

The basic collet principle is the same in all Universal chucks. Tools gripped in these chucks withstand a maximum thrust and radial load because the collet grips on a continuous surface its full length and positively locks the tool. Write today for new catalog showing the complete line of Universal collets and chucks.

210



UNIVERSAL FLOATING COLLET CHUCK for horizontal or vertical operation is positively protected against destructive action of coolant by a seal which prevents entrance of compounds into interior of assembly. Frictionless ball bearing flat springs are adjustable to counter-balance weight of the tool.

UNIVERSAL ENGINEERING COMPANY FRANKENMUTH 8, MICHIGAN

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NEW TOOL STEEL SERVICE

simplifies purchasing (and saves money, too)

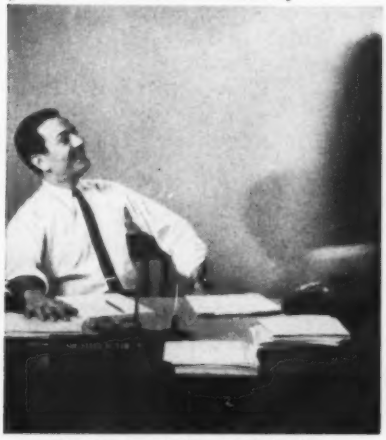
Buying assorted brands of tool steel creates costly paperwork for your . . .

purchasing and receiving departments — manufacturing and accounting, too.

With Crucible's new Tool Steel Service you cut these costs substantially

because you buy fewer grades of tool steels to do more jobs . . .

eliminate piles of paperwork throughout your plant . . .



carry fewer pounds in stock (reduce chances of inventory "mix-ups"), and . . .

pay a lower price per pound (by eliminating costs for small quantity "extras").

For the full story, call in a CRUCIBLE Service Engineer.

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CRUCIBLE STEEL OF CANADA, LTD., SOREL, QUEBEC, CANADA

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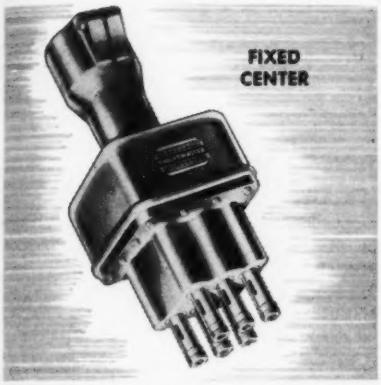
RUGGED to full tool capacity!

...FOR LONG WORKING LIFE TO ELIMINATE DOWNTIME & PRODUCTION LOSSES!



THOMSON THRIFTMASTER DRILLHEADS

DRILL • TAP
REAM • BORE
COUNTER-BORE
COUNTER-SINK
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Tremendous economies from the use of multiple-spindle drillheads are obvious. Use *THOMSON* THRIFTMASTER Drillheads for optimum performance and profits. *Ask NOW for our new catalog.*

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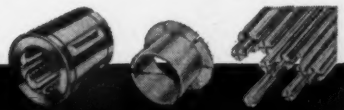
Also Makers of DORMAN AUTOMATIC REVERSE TAPPERS



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THOMSON INDUSTRIES, INC.
makers of BALL BUSHINGS • NYLINERS • 60 Case Shafting

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MINSTER
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1960 MACHINE TOOL EXPOSITION
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MEMBER OF THE NATIONAL
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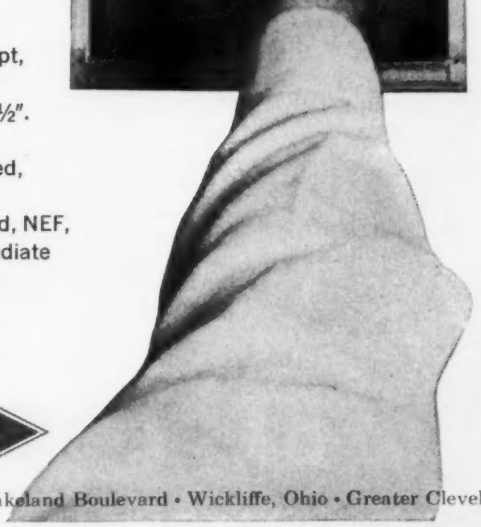
Standard Thread Plug and Ring Gages are Stock Items at Pipe Machinery

At Pipe Machinery, where prompt service is a basic precept, we maintain an extensive stock of standard thread plug and ring gages in a complete range of sizes through 1½". Minutes after we receive your order, your gages can be taken from a storeroom drawer, assembled, packaged, stamped and in the mail bag ready for shipment. For more complete information on the American Standard, NEF, Unified and pipe size gages we have available for immediate delivery, write us on your company letterhead today.



THE PIPE MACHINERY COMPANY · 29100 Lakeland Boulevard · Wickliffe, Ohio · Greater Cleveland

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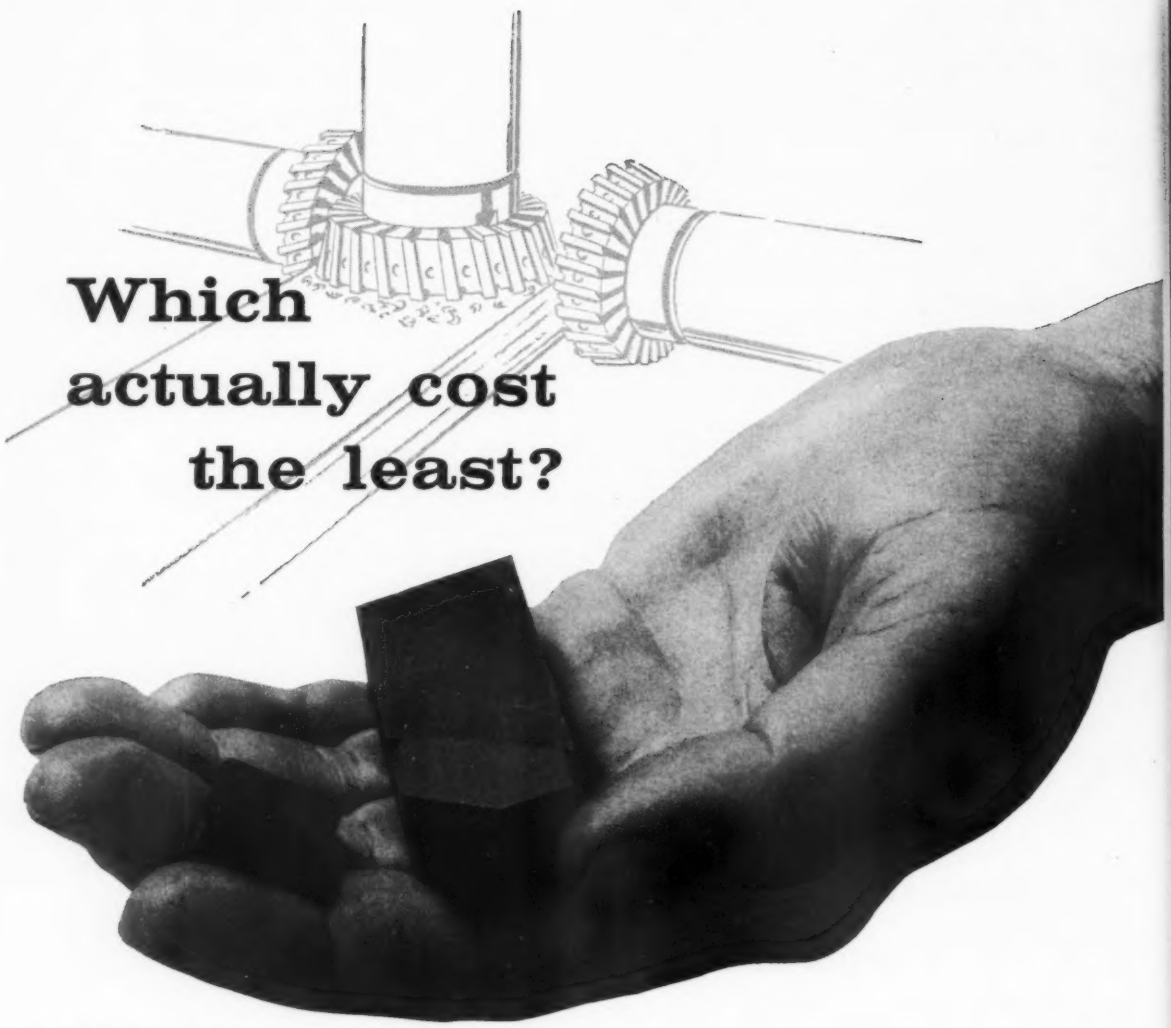
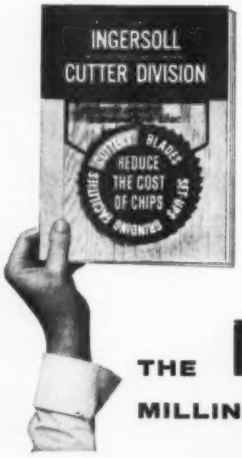


Which actually cost the least?

LOOK TO INGERSOLL FOR THE ANSWER



There's a place for each. Some say the throw-away offers the lowest-cost edge. Others prefer the tipped blade for the same reason. Both are in general use.

Analysis of work to be done, of the machine assigned to the job, and of the cutter itself will determine what blade is best. That's why many firms rely on Ingersoll's help in arriving at economical solutions to cutter problems.

For efficient, low-cost metal removal, let an Ingersoll representative make a preliminary survey. It will cost you nothing . . . may lead to important savings. Ask a representative to call, or write for the booklet, "Ways to Reduce the Cost of Chips." Address Dept. K-68.

THE **INGERSOLL**
MILLING MACHINE COMPANY **CUTTER DIVISION** ROCKFORD, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 32

Courtesy Davey Compressor Company, Kent, Ohio

tapping is now 5 times as fast with ROTOR AIR DRILL

JOB: Tapping ¼"-20 threads in side and floor plates of portable drilling rig. Formerly used hand tapping tool. Took 5 minutes per hole. A fatiguing operation.

RESULTS: New Rotor E-01PR, 190 rpm reversible air drill with No. 6 tap chuck does the work in 1 minute. Threads are uniform. Operator fatigue is eliminated.

Ask for demonstration of Rotor portable tools on *your* operations, at no obligation. Write for free copy of Bulletin 53B.

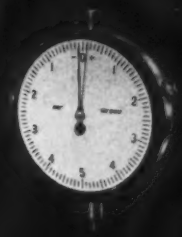
Here's the RIGHT TOOL for YOUR job!

ROTOR AIR TOOLS: Assembly Tools • Drills • Small Wheel Grinders
Straight Grinders • Vertical Grinders • Scalers • Chippers • Rammers
Special Tools • Air Motors
ROTOR HIGH-CYCLE ELECTRIC TOOLS: Grinders • Polishers • Sanders

ROTOR TOOLS®
The Rotor Tool Company · Cleveland, Ohio

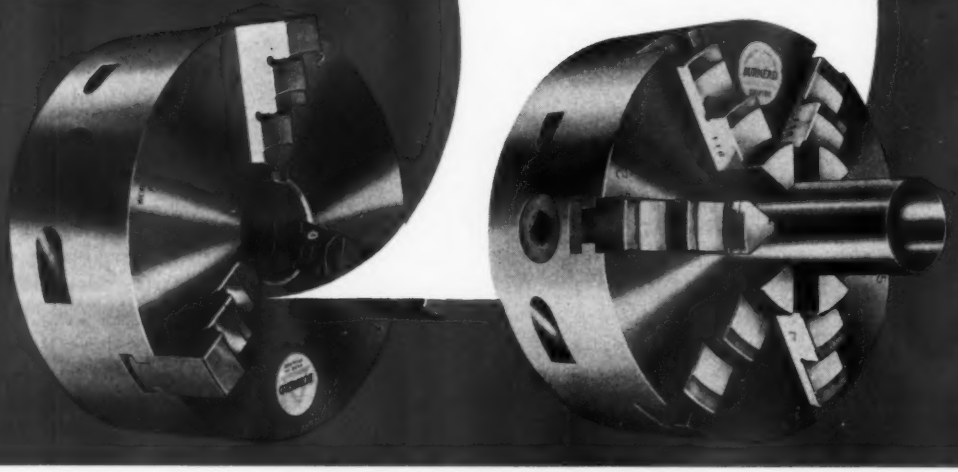
CIRCLE INFORM-A-GRAM KEY NO. 33

.0002" TIR



Means Unmatched Precision

BURNERD GRIPTRU CHUCKS



Concentricity within .0002" TIR—on one piece or thousands—is the accuracy you can expect and get with Burnerd GRIPTRU chucks.

GRIPTRU's micro-adjusting mechanism eliminates the need for expensive collets, fixtures . . . saves time, speeds output . . . improves the accuracy of any machine tool, new or old. Perfect for tool room or production departments.

And GRIPTRU chucks are built to retain their greater accuracy under the toughest working conditions—Burnerd chucks are *guaranteed for two years* against defects in materials and workmanship.

But that's not all. When you check prices, you'll be surprised . . . pleasantly surprised. Because GRIPTRU chucks cost you 20 to 30% less!

Other Burnerd chucks—3- and 4-jaw universals, and 4-jaw independents—offer the same outstanding values. Sizes range from 3¼" through 28". Get complete details by writing for descriptive literature today.

335

BURNERD CHUCKS

CLAUSING DIVISION
ATLAS PRESS COMPANY
7-218 N. PITCHER ST. • KALAMAZOO, MICH.

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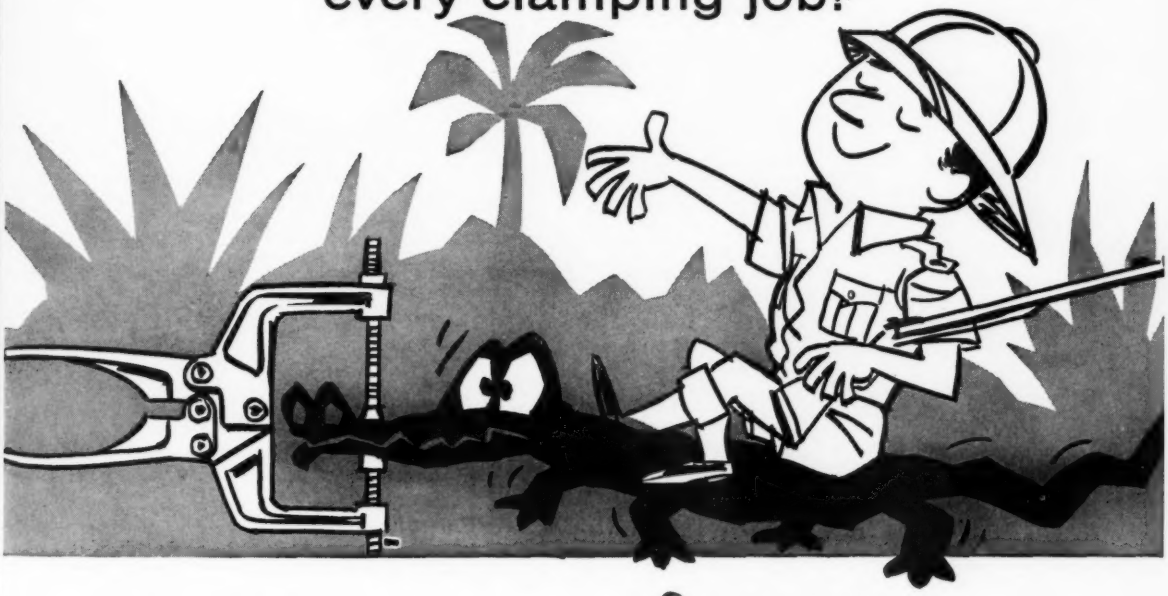
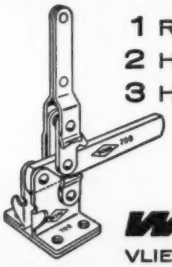
There's a WESPO clamp or plier for every clamping job!



80 models and sizes...

made better three ways to give more positive holding, last longer!



1 Reamed holes
2 Hardened serrated bushings
3 High tensile strength rivets

send for free catalogs describing Wespo clamps and fixture details

WESPO DIVISION
VLIER ENGINEERING CORPORATION
Formerly West Point Manufacturing Company
26935 W. Seven Mile Road • Detroit 19, Michigan

CIRCLE INFORM-A-GRAM KEY NO 35

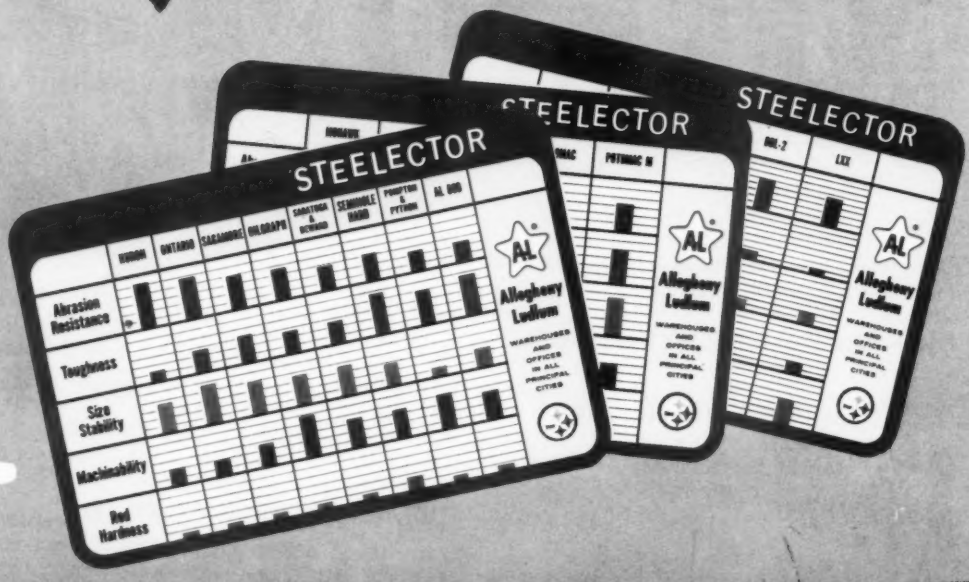
Make a Fast...Easy...Accurate Selection of the

and know your size, shape, and grade are A

The Allegheny Ludlum Tool Steel

STEELECTOR

- ✔ every type needed for 96% of all tool steel applications
- ✔ easy selection of the proper tool steel based on its individual characteristics
- ✔ stock shipment of grade and size assured at selection time



...the Proper Tool Steel for any Application

...are Available with the A-L Steelector Program

easy answer to an old problem

Starting right now, the common problem of selecting the right tool steel for any job can become a thing of the past. With A-L's new STEELECTOR Program, you can make a *first time choice* of the proper grade for any application . . . and make it FAST, almost at a glance.

eliminates guesswork

The STEELECTOR is ACCURATE, eliminating guesswork, trial runs, and expensive mistakes. And best of all, the STEELECTOR gives you a choice of tool steels that are AVAILABLE . . . in stock, right now! And they'll *stay* available . . . with a new, increased stocking program. STEELECTOR Grades are stocked according to a study of today's needs and will be reviewed periodically to fit changing requirements.

here's how it works

In the new program, a STEELECTOR Card covering each group of steels (Tool Room, Hot Work, and High Speed Grades) will help you select one particular grade as the best for your application. The STEELECTOR presents five basic tool steel properties—Abrasion Resistance—Toughness—Size Stability—Machinability—Red Hardness—as bar graphs, with the length of the bar showing the extent of each property in every STEELECTOR Grade. Find the properties most important to you and, by inspection, pick the grade with the characteristics you need.

availability assured

There is a separate Data Stock List for each STEELECTOR Grade, showing its complete range of warehouse stocks, as well as technical

data and basic application information. So, you can be sure the grade, size, and shape of your choice is in stock.

quality assured

And you can count on Allegheny Ludlum quality in every STEELECTOR Grade. They are selected from the complete line of A-L Tool Steel and made under the rigid quality control standards of all A-L products.

details available

It's all explained in the colorful A-L Tool Steel STEELECTOR Booklet, which includes STEELECTORS for the Tool Room Grades, Hot Work Grades, and High Speed Grades, and explains the Data Stock Lists for every STEELECTOR Grade. Ask your Allegheny Ludlum Sales Representative for your copy, or write: Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa. Address Dept. Ins. 7.

STEELECTOR PROGRAM

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Tool Steel warehouse stocks throughout the country

Only EX-CELL-O Contour Projectors* Give You ALL!

✓ CHECK THESE FEATURES!

☐ **LARGEST WORK AREA**—Constant eight inches of work space from lens to focal plane regardless of magnification. Plenty of room for large objects.

☐ **UNSURPASSED ACCURACY**—Famed Kodak Ektar® lenses guarantee reliable measurements with clear *accurate* images over entire screen.

☐ **BRILLIANT SURFACE ILLUMINATION**—Original design, "direct-on" built-in surface illuminator gives extra bright image and *full work clearance* at all magnifications.

☐ **ERECT—UNREVERSED IMAGE**—Correct, normal appearing images at all magnifications, eliminate confusion, simplify operation and save time.

☐ **COATED LENSES AND MIRRORS**—Produce clear sharp images characteristic of Ex-Cell-O Contour Projectors. Have been standard on all models for many years.

☐ **BRIGHT, GLARE-FREE SCREEN**—The "Fresnel" lens is exclusive with Ex-Cell-O, permits operator to see entire screen evenly illuminated from normal position. No "hot spots".

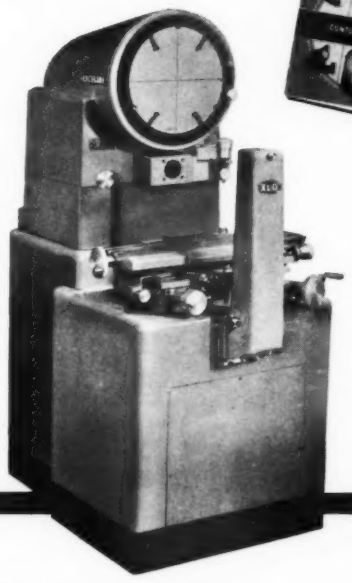
☐ **TRUE MEASURING PRECISION**—All Ex-Cell-O Contour Projectors not only read to tenths—they measure to tenths.

☐ **FINGERTIP CONTROLS**—Ex-Cell-O Contour Projectors are designed for maximum convenience and comfortable all day operation. Easy-to-reach controls.

☐ **RUGGED CONSTRUCTION**—The long established reputation of Ex-Cell-O for precision and quality assures years of trouble free operation.

☐ **YOUR OGP REPRESENTATIVE**—Will help you make sure you get the right Ex-Cell-O Contour Projector to fit your optical gaging requirements. Call him today!

Write for new edition of EX-CELL-O Contour Projector Booklet—Available Now!



*Manufactured by EX-CELL-O Corporation at Detroit, Mich.

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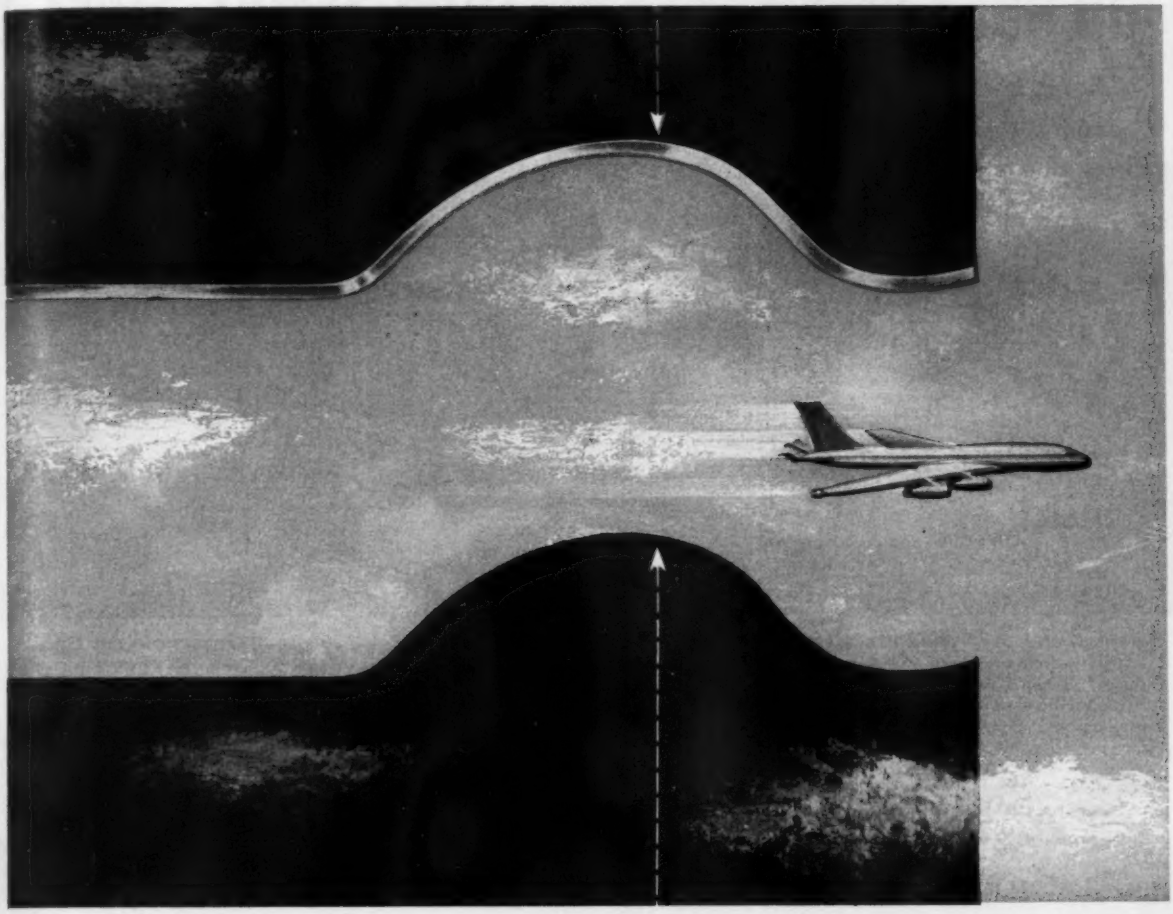

Want to save with plastic tools and dies?

Your EPON® RESIN tooling formulator can help you

Tools and dies made of tough but easy-to-handle Epon resin can save you up to two thirds in time, one third in cost! Your tooling resin formulator will show you how Epon resin formulations are saving time and money—*right now*—in applications such as:

High-temperature tooling: Metal-forming stretch dies that can operate at temperatures over 400° F.

Heated tools: Matched dies, with integral heating units, may be made with Epon resin formulations for rapid heat-curing of laminated plastic parts.

Long-lasting metal-forming tools: Castings made of formulated Epon resin, mounted in a crank press, showed no permanent deformation after 28,000 compression-shock cycles.

For tool and die applications, Epon resin formulations offer you the following important advantages:

Excellent tolerance control: Little machining and handwork are required to finish Epon resin tools because of the material's excellent dimensional stability and lack of shrinkage.

Outstanding strength: Jigs and fixtures with thin cross sections can be built from Epon resin-based formulations reinforced with glass cloth. The resulting laminate has high flexural strength and excellent dimensional stability.

Easy modification: Tools and fixtures made from Epon resins may be quickly and easily modified to incorporate design changes.

CONTACT YOUR TOOLING RESIN FORMULATOR

The combination of resin formulator's skill and application knowledge, backed by Shell Chemical's research and resin experience, has solved many important tooling problems for industry. For a list of experienced tooling resin formulators and additional technical information, write to:

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Eastern District
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IN CANADA: Chemical Division, Shell Oil Company of Canada, Limited, Toronto

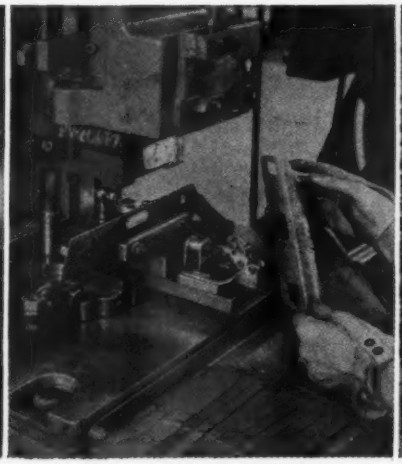
SHELL

CIRCLE INFORM-A-GRAM KEY NO. 39

39 OBI'S GIVE PRESS DOLLARS 3-WAY STRETCH

Newly installed Niagara Inclinables provide required precision at lowe investment, produce more parts per hour, and cut maintenance to the bon

SERVING ONE OF THE WORLD'S LARGEST typewriter manufacturers in a brand-new plant, 39 new Niagara Series A Open Back Inclinables play a key role in the production of nearly 2000 precision parts for portable machines. With selection based on past experience, these presses are more than living up to expectations . . . performance-wise and dollar-wise.



.001" TOLERANCES ARE MAINTAINED as Niagara OBI's engage in a wide variety of piercing, notching, trimming, bending and intricate forming operations. Here, a hinge tab is given a final bend on a 22-ton Niagara Series A. Rigid press frames and short-coupled, multiple "V" gibs not only insure precise production, but lengthen die life.

BOOSTING PRODUCTION 30%, these fas acting hand fed OBI's turn out an averag of 1300 pieces an hour per machine. Th reason: Instant clutch engagement an disengagement at every press stroke pr vide more working strokes per minut Niagara's famed multi-point mechanic sleeve clutch picks up the load on 1 engaging jaws and applies driving forc concentrically without keys or pins.

EVERYTHING HUMS ALONG SMOOTHLY day after day. Niagara OBI's are unmatched for dependability and safety. With fewer parts and simpler construction, there's less to go wrong . . . less to repair and replace. No complicated electrical circuits, limit switches or solenoids . . . no palm buttons, air valves or rotary connections.

MAINTENANCE IS SHAVED TO AN "ABSOLUTE MINIMUM" according to this Niagara user. Unlike other presses previously utilized, these Series A's do not require constant "doctoring." There's no need for frequent adjustment of the clutch sleeve and brake. No "dogs" to break off and require replacement. No press can match its economy.

WANT TO STRETCH YOUR PRESS DOLLAR TOO? Write for illustrated Bulletin containing the facts and figures on Niagar Series A Open Back Inclinable Presse (built in 13 standard sizes with shaft di ameters from 1¼" to 6½" and capaciti from 5½ to 190 tons). *Niagara Machin & Tool Works, Buffalo 11, N. Y., Distri Offices and Distributors Everywhere.*

NIAGARA OBI PRESSES

America's mos complete line presses, press brakes, shears, other machines and tools for plate and sheet metal work

MMPE MODERN MACHINE TOOLS FOR PRODUCTION EFFICIENCY

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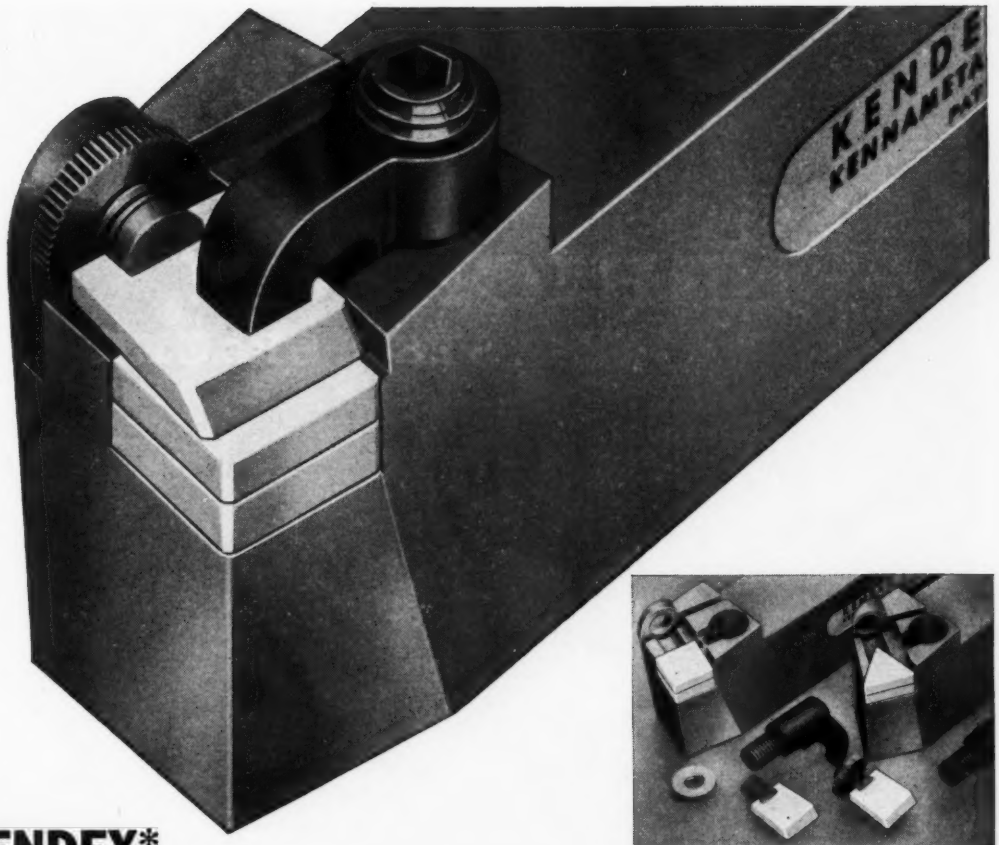

NEW KENDEX*
DIAL-A-BREAKER
Easily adjustable . . . attached chipbreaker

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You no longer need a different breaker for every cutting job. Now you just turn the dial and position one chipbreaker for *several* jobs. Minimum of parts to stock . . . only two chipbreakers required for 70 styles and sizes of holders.

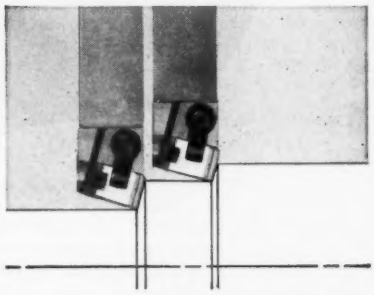
Close ganging of tools presents no adjustment problems with the Kendex Dial-A-Breaker. *All* changes and adjustments . . . chipbreaker and insert . . . can be made from the top of the holder. (The clamp screw is also accessible from the bottom of the tool when mounted in an inverted position on the rear carriage.)

Kendex Dial-A-Breaker Tool Holders have the same basic design and accommodate the same solid Kennametal shims and "throw-away" inserts as used in standard Kendex holders. They are available in positive or negative rake, and with square or triangular inserts.

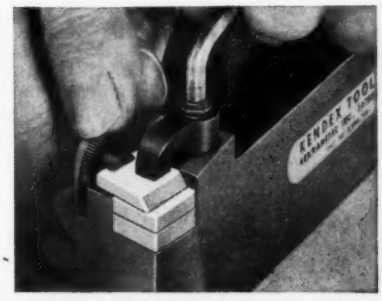
Get more information. Ask your Kennametal Representative for a demonstration . . . or write KENNAMETAL INC., Latrobe, Pa. 33501

*Trademark

Holders illustrated with clamps and chipbreakers removed show positive seating of both triangular and square inserts. When not required, tool may be used without chipbreaker, with clamp set directly on the insert.



Easily accessible for adjustments. Permits close ganging of tools.



Easy adjustment, regardless of tool position. Just release the clamp and "dial" the breaker to any position desired.

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CIRCLE INFORM-A-GRAM KEY NO. 41

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MASTER SPACER

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gives increased production and optimum accuracy in

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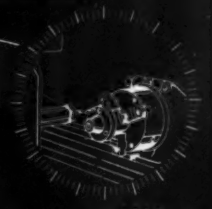
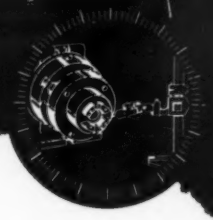


milling

jig drilling
with either micrometer or "Jo" block setting

inspection



Write for free catalog "Erickson Master Spacer" today. And at the same time request your copy of Catalog K: you'll find cost-slashing applications for all Erickson holding tools.

The new Erickson Master Spacer quickly and accurately positions work for a wide variety of jobs. This *one* tool can eliminate expensive jigs and fixtures . . . makes it a simple procedure to set up drilling, milling, boring and special machining operations.

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CIRCLE INFORM-A-GRAM KEY NO. 42

ELECTROHYDRAULIC FORMING

ELECTROHYDRAULIC OR HYDRO-ELECTRIC forming is the newest member of the family of high energy rate metalworking techniques to command our attention.

As disclosed at recent technical gatherings, the SAE Aeronautical meeting and the Westinghouse Machine Tool Forum, the process differs from the more familiar work that is being done in the field of chemical explosives — explosive forming.

The principal difference is that in the electrohydraulic forming of metals an electric spark discharge generates the metalforming energy rather than a cartridge or shell containing an explosive charge.

The spark discharge takes place in a fluid medium which is contained by the metal to be formed. The metal workpiece is, in turn, backed up by a female die.

This is a closed-die setup, in that there is no fluid or water between the workpiece and the face of the die.

Thus when the spark discharge is triggered a shock wave (of mechanical, not electrical, energy) is created which travels outwardly through the water, and impinges against the metal, thus forcing it against the die to produce the desired shape.

As noted above, the shock wave is acoustical energy, not electrical, and that it is of high energy magnitude is attested to by the fact that electrohydraulic forming gives promise of being particularly useful for hard-to-form metals and shapes that are difficult to handle with conventional processes.

Continuing experimental work is underway by several potential users in order to determine electrohydraulic's place as a manufacturing process, and Chrysler, Convair-General Dynamics, and Republic Aviation are engaging in experimental production.

The basic circuitry involved in electrohydraulic forming consists of a rectifier supplying a bank of capacitors through a charging resistor, and a discharge circuit made up of a switch and a spark gap within the vessel containing the water or other fluid.

The spark discharge can be considered as "underwater lightning," and the resultant shock wave or "thunder" is the acoustical energy that actually does the shaping of the metal against the restraining die.

The process is somewhat similar to explosive forming but does have several marked advantages, the greatest of which is its complete controllability. This permits its use within the plant. Often explosive forming has to be done outside due to safety precautions, particularly during its experimental stages.

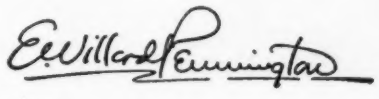
Pioneering users of electrohydraulic forming are finding it both accurate and repeatable. For most systems now being considered, the simple resistance-capacitance charging circuit is adequate, but as systems grow larger and production uses multiply, more sophisticated electrical charging systems will evolve.

Initially, Convair has employed voltages ranging from 14,000 to 22,000, and capacitor banks of from 30 to 60 microfarads. With this setup, or power source, small sample parts were formed from stainless steel, copper and aluminum, with attained pressures in excess of 80,000 psi.

In hydro-electric forming the only force transmitted to the die is that of compression. Thus, for short run applications, epoxy dies, with their high compressive strength are in favor.

As of today, hydro-electric or electrohydraulic forming of metal is a new and most promising state of the art. As such, it is surely worthy of a standard nomenclature. The SAE Aeronautical meeting reported on "hydro-electric"; the Westinghouse presentation covered "electrohydraulic".

Which shall it be? We favor the single, un-hyphenated word: Electrohydraulic.



Editor

Typical Standard Subland Drill-Counterbore, one-pass cavity for socket-head cap screw. Clean, accurate absolutely concentric hole with one-tool depth control.

...with.. MOHAWK STANDARD SUBLAND DRILLS

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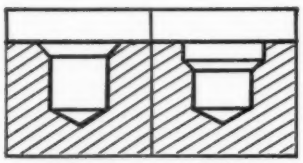
Send for your Copy... of the new Mohawk "Standards" Catalog. Lists all practical sizes, types plus easy method of determining your needs ...more economically.



Subland Drill-Chamfer Subland Drill-Drill

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Tap Drill and Body Clearance for Screws and Bolts.

Mohawk TOOLS, Inc.
Montpelier, Ohio

world's largest producer of Sublands

CIRCLE INFORM-A-GRAM KEY NO. 44

Vol. III, Coutelier, Pl. I.

Plate 179 The Cutler

Another of the Parisian shops open to the gaze of the curious is that of the cutler, whose guild had the right to forge, fabricate, and sell knives, scissors, razors, surgical instruments, and other edged implements. He bought his steel in bars, forged the blades, and ground his edges on the wheel (Fig. 2), which imposed on the grinder a posture so characteristic as to have been almost emblematic of the trade. Working at the vise are two journeymen, one (Fig. 5) with a file and the other (Fig. 4) with a bow-drill for boring. An apprentice at the desk gives a razor its final edge, and Madame, leaving the cash drawer for the moment, arranges her wares in the showcase.

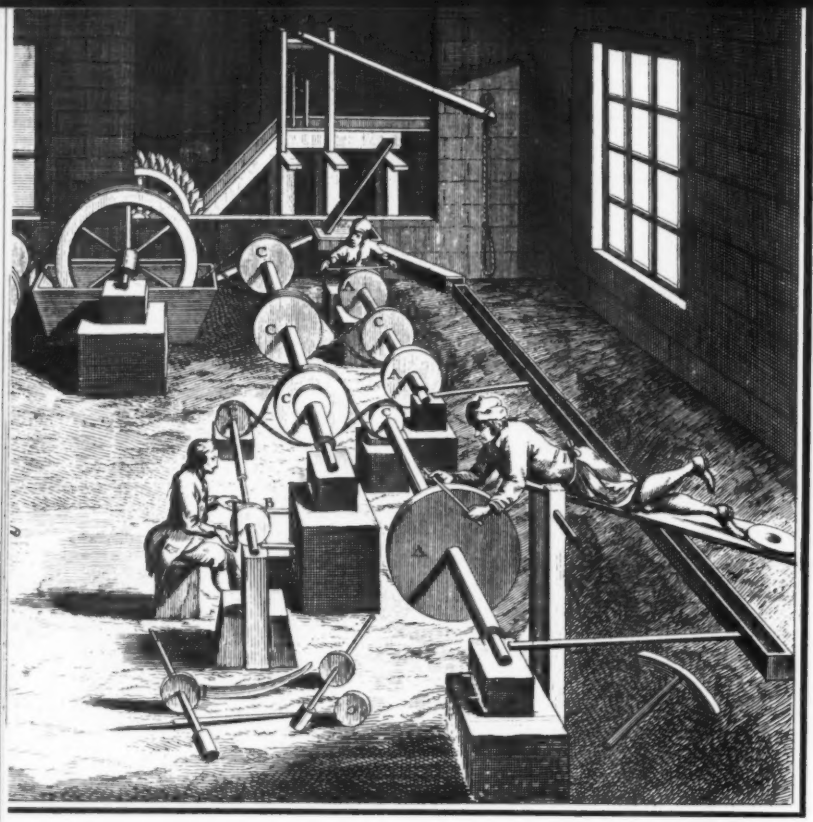
(Manufacturing and sales headquartered in the same room in an 18th Century cutlery shop. Note the man-powered grinder.)

Manufacturing

. . . in retrospect

THE METAL INDUSTRIES were of such major interest to the philosophers of 18th Century France that some of the leaders of the "Enlightenment" worked more than 25 years to complete *L'Encyclopédie, ou Dictionnaire Raisonné des Sciences, des Arts et des Métiers,* or the Pictorial Encyclopedia of Trades and Industry, in 1763. Sparked by one Denis Diderot, it is history's first systematic illustrated survey of industrial knowledge of the time, and it brought about great advances in industrial growth by revealing trade and industrial secrets that had been concealed from outsiders for generations by trade monopolists. In a way, the encyclopedia can be considered a forerunner of today's trade journals and other technical literature.

Many of the engravings from the original volumes were reprinted for the first time late last year by Dover Publications, Inc. On this and succeeding pages we present a selection of the illustrations dealing with manufacturing in the 1700's —for your enjoyment and edification. The man- and horse-powered production of those days are a great contrast to today's. We thank Dover Publications for permission to reprint the material in this issue of Tooling & Production.—**The Editors.**



(Mass-production grinding, 18th Century style. Power originates from horse-drawn treadmills on the floor below.)

Vol. IV, Fourbisseur, Pl. VII.

Plate 183 The Swordmaker

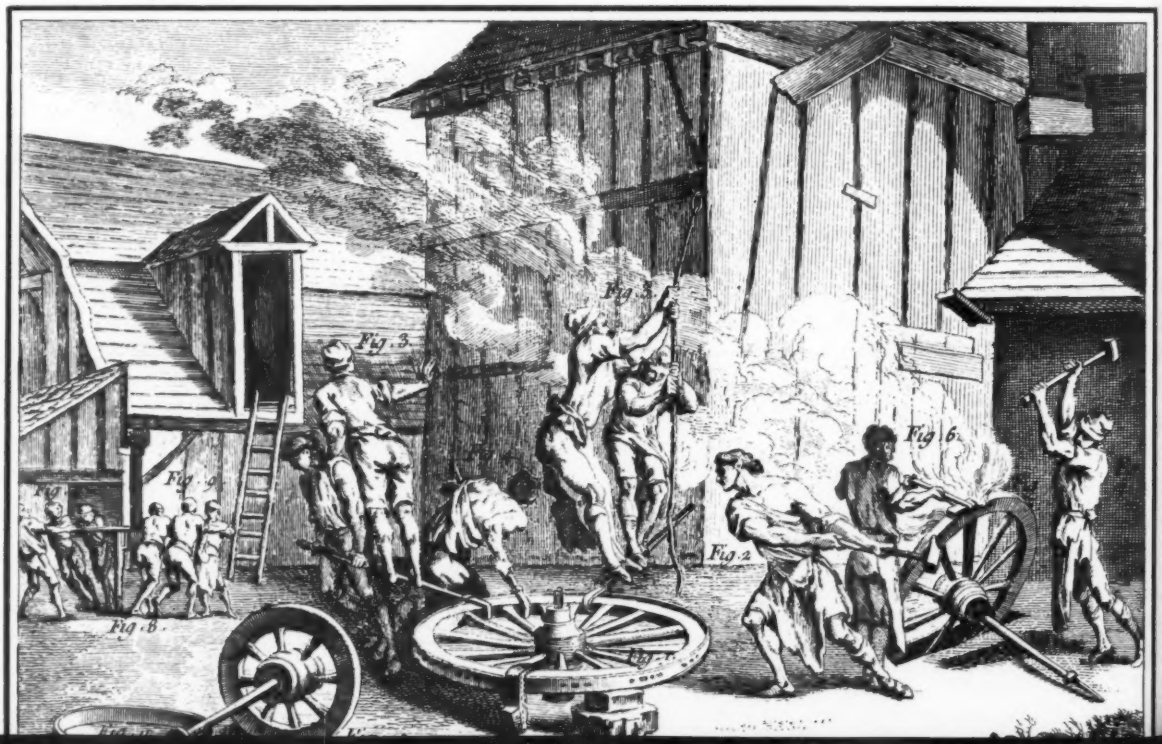
The workmen in the shop emboss, gild, and embellish guards and hilts and affix them to the blade, but the edge must be ground by a cutler working over his wheel. Until very recently, the grinders of Thiers, the cutlery center, still assumed this posture in their trade.

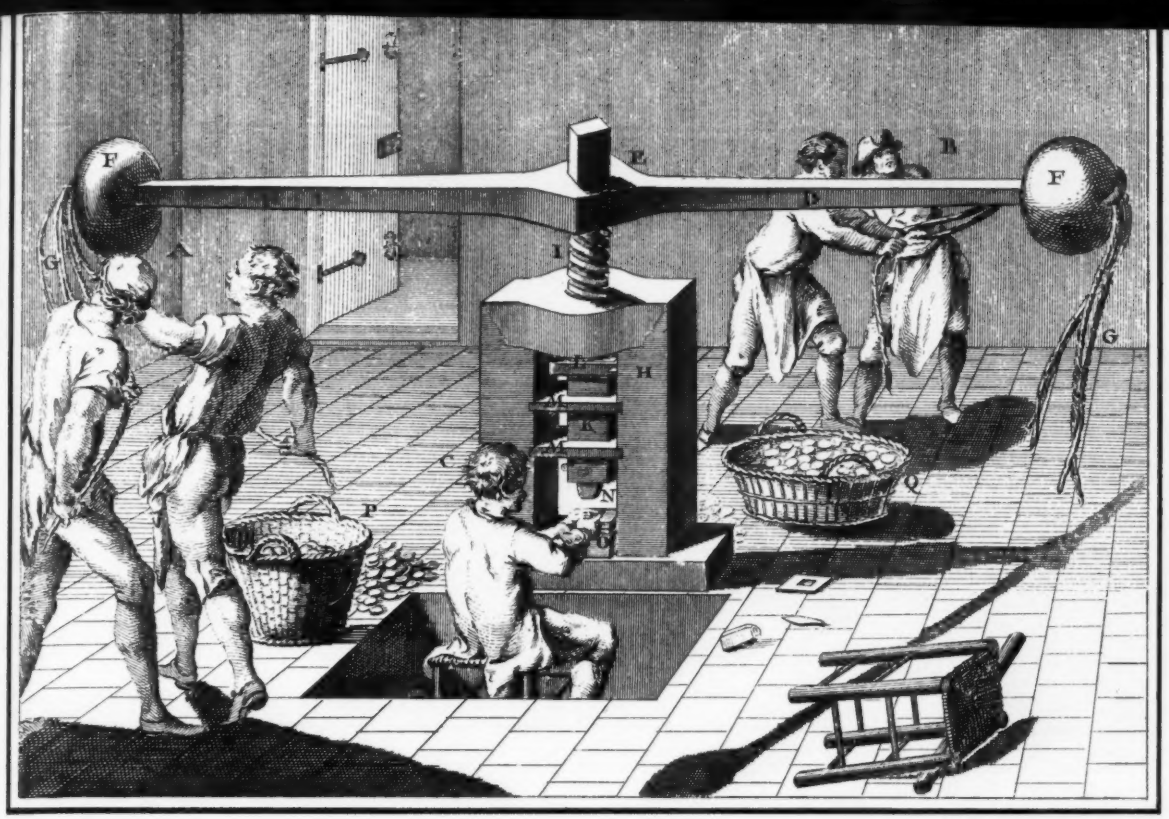
Plate 175 A Heavy Smithy

The American blacksmith turned his hand to everything, but in France occupations were more specialized. The maréchal ferrant et opérant *(the English farrier) tended horses, combining shoeing with veterinary services. The smith's heavier work was the province of the* maréchal grossier, *whose apparently frantic employees are at work on wagon wheels. The six men in the background (8, 9) are threading an axle-tree. The others are rimming a wheel. Figs. 10 and 11 show a front wheel and the iron band which will be mounted on it. The workers of Figs. 1-4 are prizing and hammering a rim over the wheel. The two men on the right are driving home nails.*

(The wagon wheel manufacturing shown below is a far cry from today's fast automated lines.)

Vol. VII, Maréchal grossier, Pl. I.



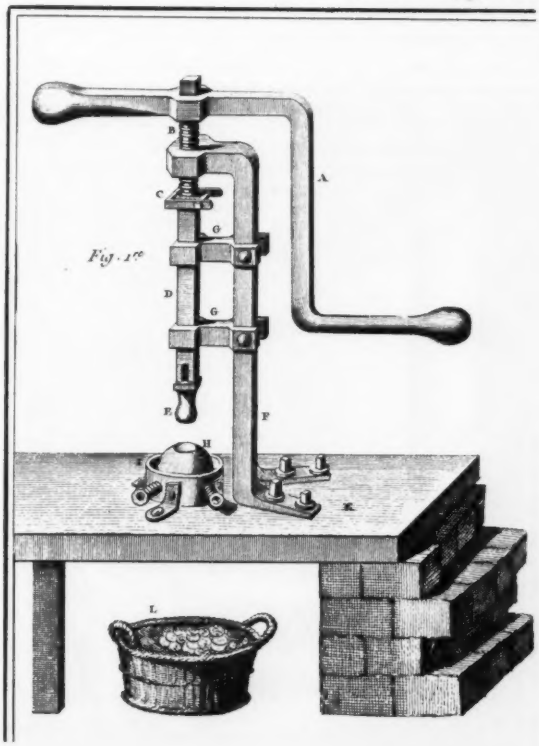


Vol. VIII, Monnoyage, Pl. XV.

Plate 205 Coining

The press is fitted with two matrices. One prints the head of Louis XV on one side of the coin, and the other the "escutcheon," corresponding to our "tails." Blanks from basket (P) are stamped one by one and tossed into the second basket (Q).

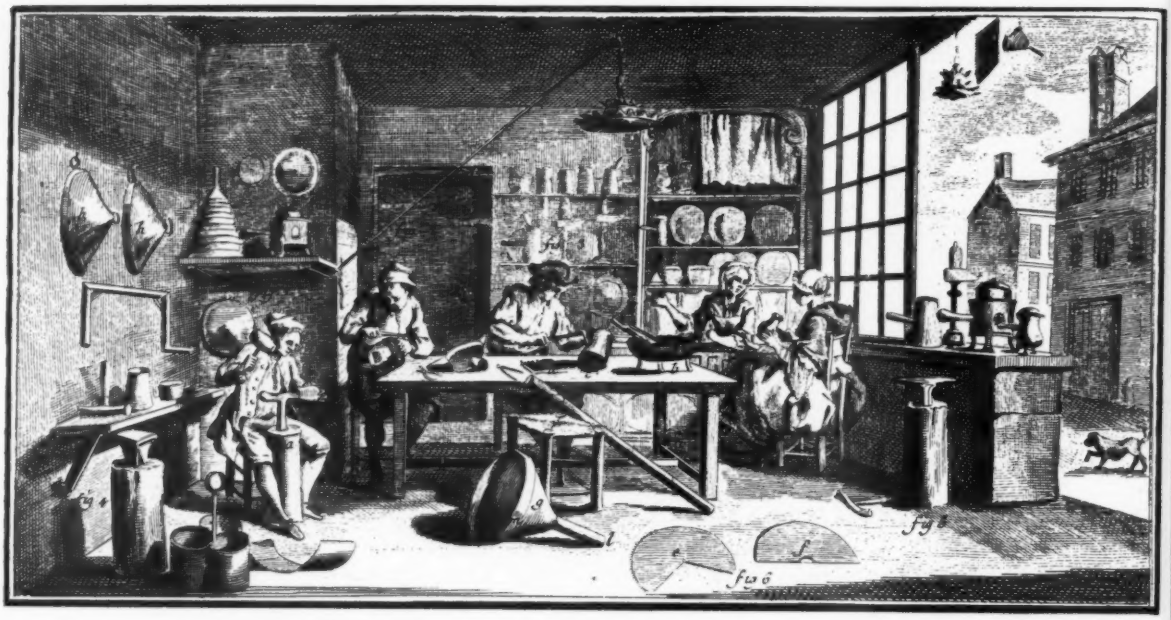
Vol. VIII, Monnoyage, Pl. XII.



(Coins, too, were made one at a time two centuries ago. Could we afford coins today if the presses and methods hadn't changed drastically through the years?)

Plate 203 Coining

Plate 203, Fig. 1re is the machine for punching out blanks. The artist appears to have made a mistake in representing the basket (L) as full of figured coins—at this stage they should be only discs of gold or silver.



Vol. IV, Ferblantier, Pl. I.

Plate 180 The Tinsmith's

Kitchen utensils were manufactured by the tinsmith, who displays items of tinware on his counter and hanging in the shopfront. Among his products were oil lamps of various designs. His own shop is lit by a ceiling lamp which for lighting or refilling is raised and lowered by a cord. At the moment the men are making coffeepots. The artisan in Fig. 1 fashions the body of the pot on a small anvil. Next to him (Fig. 2) the rim is filed to ensure a tight-fitting cover. At the workbench the master solders the spout into place. He has his strips of soldering tin (d) before him, and heats his irons in the brazier (b). On the floor (Fig. 6) are cutouts, one (e) for making covers (h) and the other (f) to be bent around to make the mouth of the big funnel (g).

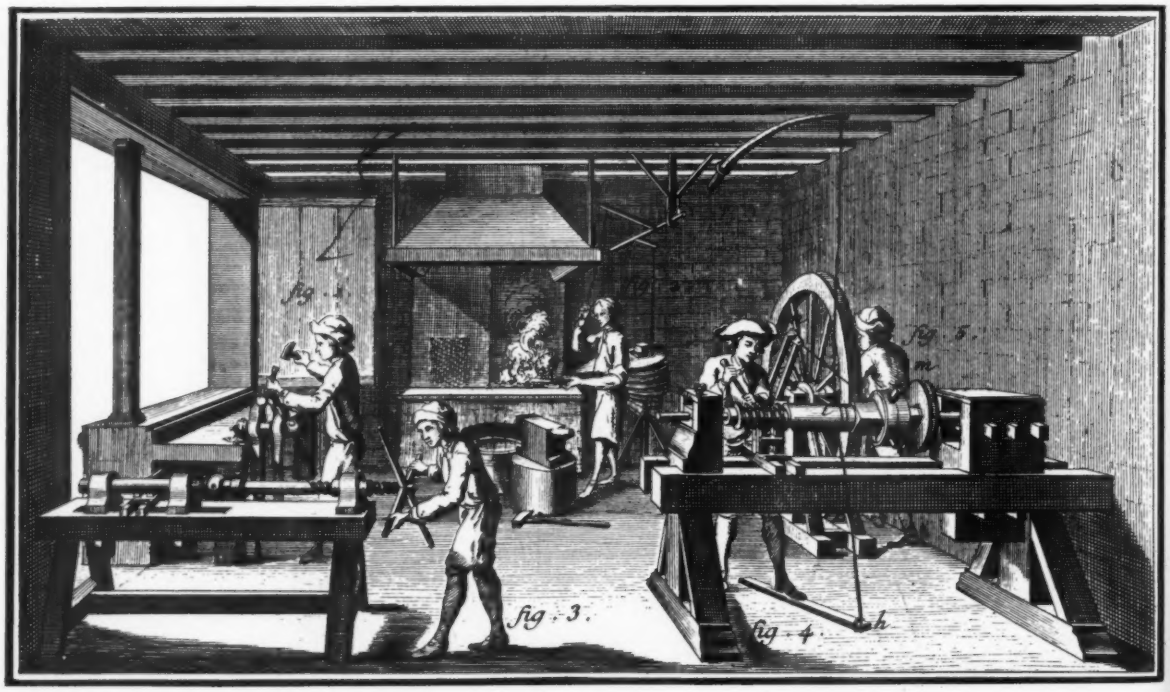
(Too bad these folks didn't have automatically controlled presses, gas and induction heating elements, and other modern equipment for making coffee pots and related tinware.)

Plate 172 The Toolmaker

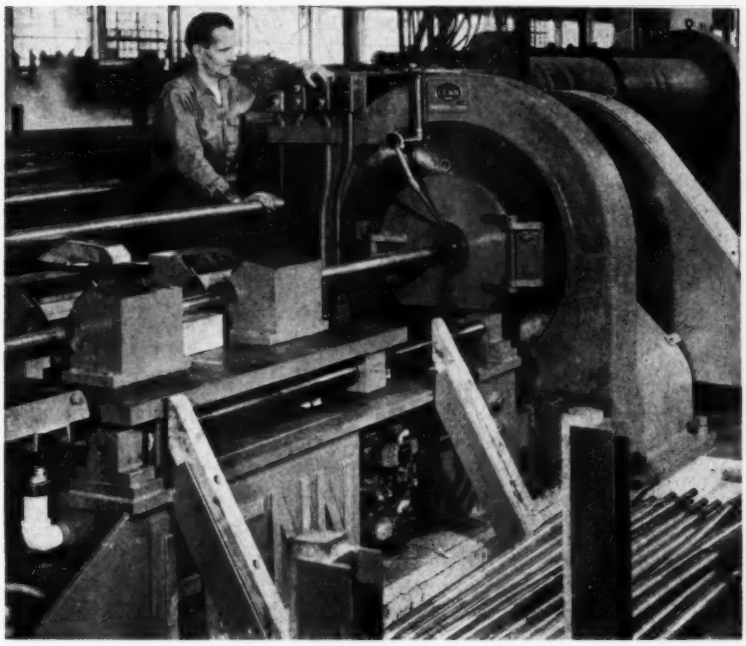
The lower vignette represents a much more advanced level of machining. It is a shop for threading screws and worms. In Fig. 1 the workman is tracing out the pattern of a thread on a steel rod. The machine of Fig. 3 is a threader, as on a much larger scale is that of Fig. 4. The latter is turned by the wheel (5), which is cammed to reverse the rotation while moving back and forth the width of the thread with each revolution.

(Not numerically controlled and electrically powered, but hand- and foot-controlled and manpowered are these 18th Century lathes.)

Vol. IX, Taillanderie, Pl. I, and Taillanderie, Fabrique des Etaux, Pl. I.



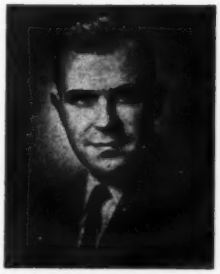
Fifth of a Series



Swaging an "end reduction" on 2" tube.

Feeding a Rotary Swager

This is the final article of a series on rotary swaging. Others covered swaging principles and capabilities, the metallurgy involved, the choice of a swager, and tooling for swaging. See T&P, Oct. and Dec. 1959, and Feb. and May 1960.



by Keith Bernhardt

Mr. Bernhardt is sales engineer at The Fenn Manufacturing Company, Newington, Conn.

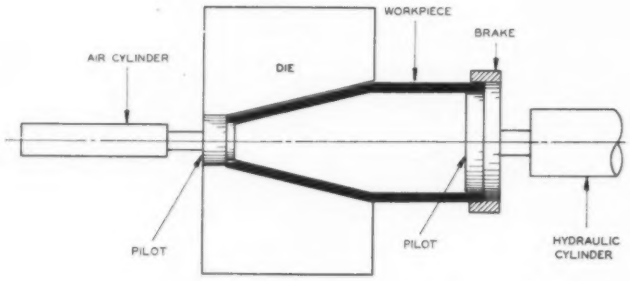
SWAGING STARTED OUT as a hand-feed operation and for some work it is still done in this way.

If hand-feeding is to be used the "angle-of-swage" should be in the 6-8° (included angle) range. However, the growing trend toward the use of feeding fixtures has permitted the swaging angle to be increased to as high as 14°. On small sections (up to 1/4" dia) much steeper angles can be used, and on copper or aluminum tubing it is possible to go up to 30°.

In general, whether a manual or mechanical feed is used, the feed-rate is strictly a function of the included angle, since die design is based on the wedge principle. It is well known that angles around 7° are locking angles which will enhance feed-rate.

Normally, a feed-rate around 5 fpm can be obtained with a 2-die swager, whereas a 4-die swager lends itself to feeding at a 6-8 fpm rate. On the other hand, swaging has been done at a 50-100 fpm rate where reduction was 10 thousandths on the diameter. This gives some idea of range and shows that each requires individual study to determine its parameters.

The most satisfactory general purpose feed force is manual, because the intermittent out-of-the-die thrust is easily absorbed by the hands. The operator can also in-



This workpiece has just been swaged. To remove, a hydraulic metering valve will be opened to allow the air cylinder to force the hydraulic cylinder to the right. As this takes place, workpiece will remain between its pilot-centers. After removal, pilots are again loaded, and at that time the hydraulic cylinder is moved to the left, overcoming the air cylinder. A smooth powerful feed moves work into dies and the brake arrests rotary motion, to suit.

crease or decrease the pressure — or offer resistance — more effectively than a mechanism. However, a mechanical feed-fixture can approach this if equipped with rubber to grip the work.

Hand swaging is best from the standpoint of control, but its use is limited by other factors. A man can do only so much holding and produce so much thrust.

It is not unusual to find mechanical resistance so great that a power feed is a must. Although a manually operated feed with some mechanical advantage may be useful, mass production usually dictates a power-actuated feed.

A pulsating end-thrust is set up by the opening and closing of the dies—coupled with the wedge-effect. This thrust which drives the work out of the dies is referred to as "kick back," and the operator's attempts to counteract it may not be satisfactory. The only time he can "gain ground" is when the dies are momentarily open. It may be impossible to "get-with" the cycle; in fact, the machine may get ahead to the point where the work is just returned to the same position each time the die closes. Under these circumstances some power feed must be employed.

A feed-fixture is especially useful on large, heavy work or unwieldy light work. In most cases the feed will be slower than a hand operation, but over the long run the feeder will out-produce hand feeding since no fatigue enters the picture.

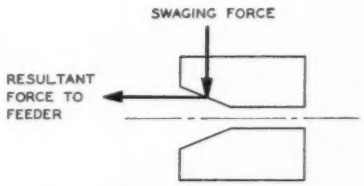


Fig. 2. Wedge principle diagram showing feed-rate to be a function of the angle.

In choosing a feed method (hand or otherwise), the length of the work is the first consideration. Lengths up to 1′ can be swaged by hand but those longer — up to 3′ — have a tendency to whip. This can be reduced somewhat by the use of a guide on the door, or a pilot built into the die. Work from 3-20′ reacts like that up to 1′, but lengths greater than 20′ are almost always power fed. These are general rules which enjoy considerable overlap.

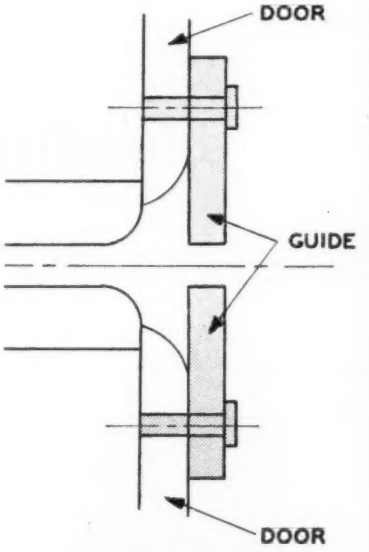


Fig. 3. Whip tendency may be controlled by a guide on the machine or by a pilot built into dies.

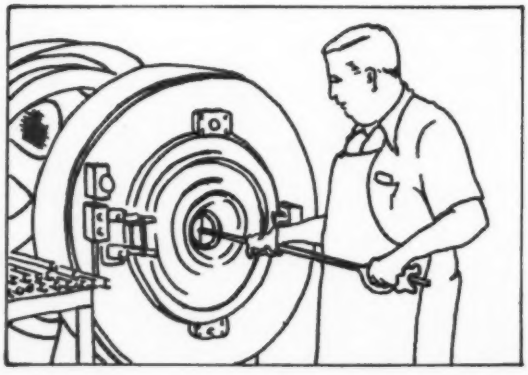
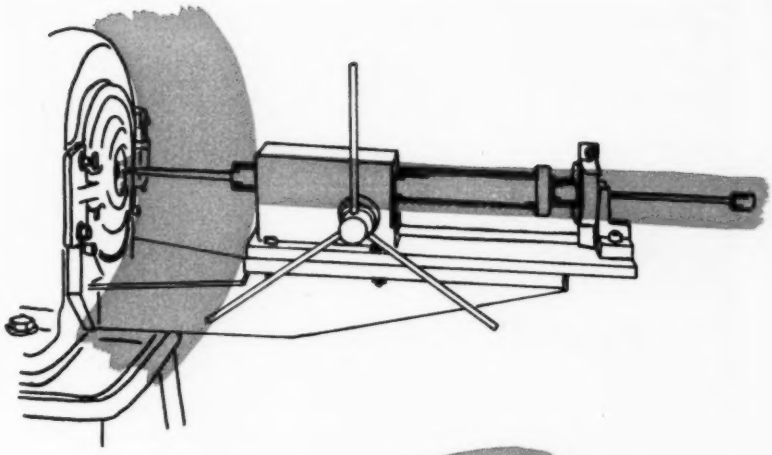


Fig. 1. Hand feeding a rotary swager. This is "pointing," shown prior to drawing.

Power feeding fixtures may be pneumatic — but, since air is compressible, the inherent bounce can reduce their effectiveness. Consequently, the use of hydraulics is favored. Sometimes pneumatics

Fig. 4. The collet feed shown here is rotation-controlled by the brake.



and hydraulics are combined effectively.

There are three prominent feeder concepts: 1) A rotating collet whose rotation is controlled by a brake, and the entire mechanism fed to the swager by a hydraulic cylinder. 2) The use of a traveling vise to hold and feed the work. This is frequently used. Here rotation is checked by controlling pressure on jaws. 3) Roll feeds are useful where straight through swaging is required on long work. This method can accommodate either solid or tubular work.

Since swaging rotates the work, and some rotation is necessary, the best finish is achieved with an adjustable brake. The brake also prevents twisting thin-walled parts which would otherwise have to be clamped tight.

For effective use, feeding fixtures must have maintained-alignment by either direct attachment to the swager, or by attachment to some stable member.

Automation is often useful, but since it is a separate entity and subservient to one of the feed arrangements, it will not be discussed here. However, if a job is an automation-candidate, the use of automation should be given consideration when the feeder-choice is made.

end

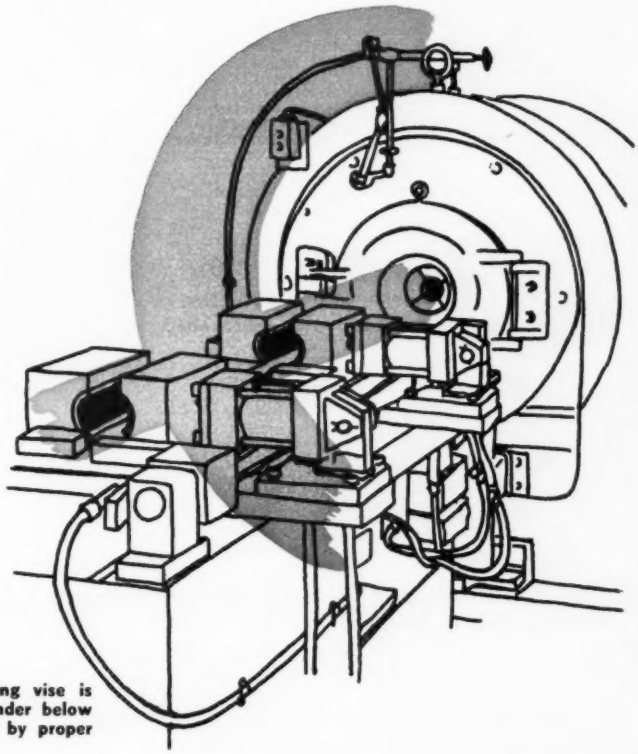


Fig. 5. Here a travelling vise is fed by a hydraulic cylinder below table. Rotation-check is by proper vise pressure control.

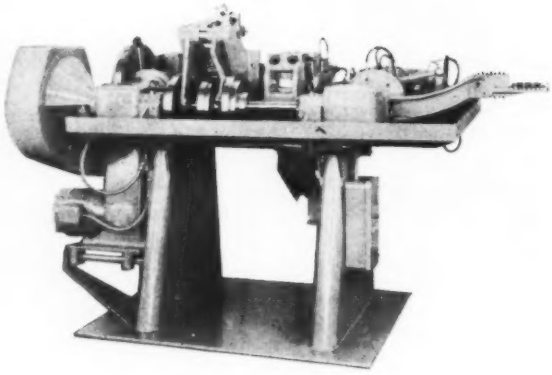
Huebner Elected Chrysler Institute President

George J. Huebner, Jr., has been elected president of the Chrysler Institute of Engineering. He will also continue as executive engineer and head of research in the Chrysler Corp.'s Engineering Div'n.

Mr. Huebner is the fourth president of the Institute, which offers a two-year graduate program leading to the degree of master of automotive engineering. He started with Chrysler in 1932 as a laboratory engineer and became chief engineer of the research section in 1945. In 1952, Mr. Huebner was named executive engineer, research section and missile branch. He assumed his present duties in 1955.

from the cover:

First R-W-I Metal Former



R-W-I former set up in horizontal position is conventional looking, but . . .

WHAT'S AN R-W-I? It's new and it's unique. More specifically, it's Baird Machine Company's new ribbon-wire-inclinable metal former—an inclinable four-slide.

It will form 1½" wide ribbon or 3/32" dia mild steel while set up at any angle from horizontal to vertical. The accompanying illustrations show three of the many possible positions.

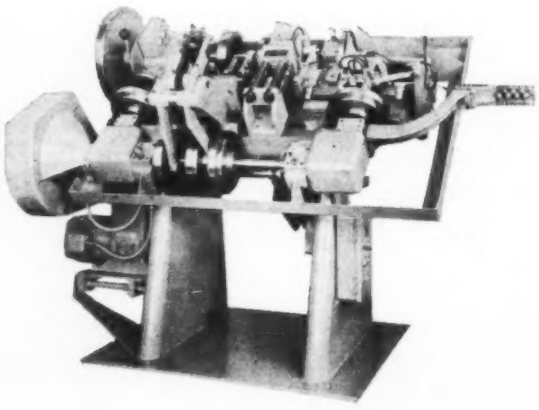
Because of the inclinable feature, dies are more easily accessible and ejection can be gravity-assisted. This is important when larger parts are worked.

The new press adapts standard post-guided die sets, and tools for conventional Baird No. 1's can be used in it. A reversible mounting feature permits easier die tooling to put the burr on either side of the stock.

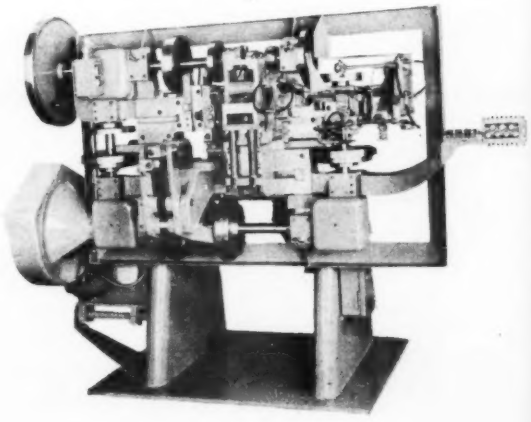
The press is open at the rear for piercing, tapping, or other attachments. Normal speed with its variable speed drive is 75-300 parts/min. With high speed cams and short feed, up to 400 parts/min can be handled.

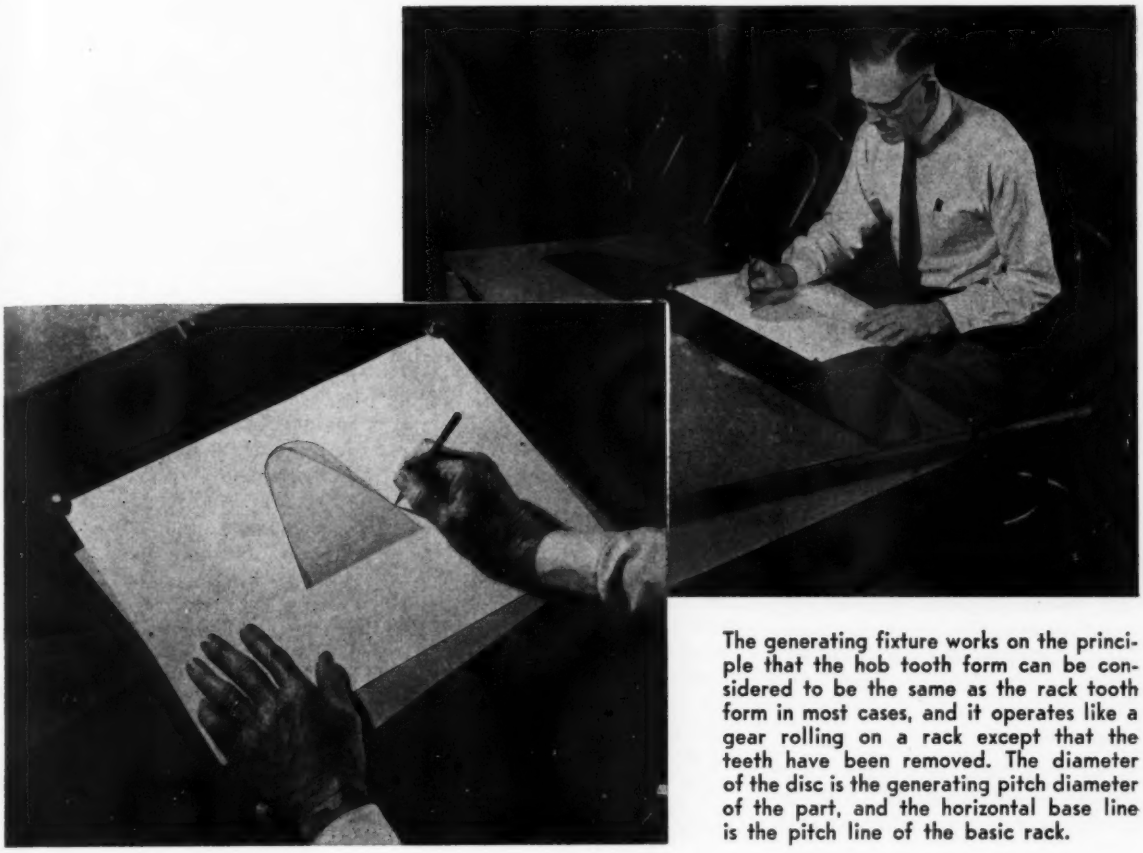
The new R-W-I will be demonstrated by Baird Machine Company at the Machine Tool Exposition-1960.

. . . at a 50° tilt it makes scrap and part removal and tool setup and inspection easier, and . . .



. . . at 90° it'll also handle oversize parts with ejection to the front of the machine.





The generating fixture works on the principle that the hob tooth form can be considered to be the same as the rack tooth form in most cases, and it operates like a gear rolling on a rack except that the teeth have been removed. The diameter of the disc is the generating pitch diameter of the part, and the horizontal base line is the pitch line of the basic rack.

Fixture Shows How Gears Are Generated

by M. E. Samuelson

Hob Engineer
Barber-Colman Company
Rockford, Illinois

FOR MANY YEARS, Barber-Colman Engineers have used the Gear and Special Form Generating Fixture as one means of determining the hob tooth form required to produce the customer's part. Although most problems can be solved mathematically — and we are using our Bendix G-15 computer for a faster solution of many of these problems — the generating fixture shows the whole hob tooth form and is an excellent means for solving some problems. Since several customers have become interested in this fixture for design, engineering and training purposes, we have now made the generating fixture available to the gear industry.

The fixture produces the tooth form relationship between a rack tooth and the conjugate part tooth form. Normally, the rack tooth form can be considered the same as the hob tooth form, allowing the fixture to be used for generating a part tooth from a given hob tooth form. Both the hob tooth and part tooth are magnified on the fixture,

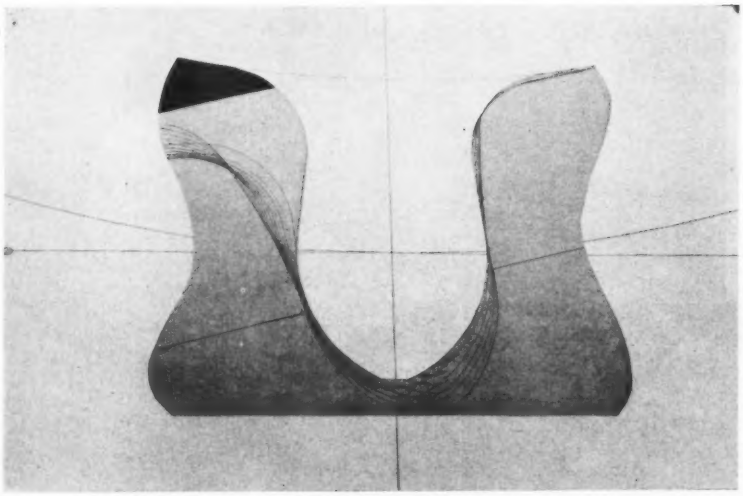


Fig. 1. The hob tooth for a clock tooth form is generated from an enlarged template of the part tooth.

the amount of magnification depending primarily upon the diameter of the part and the tooth proportions.

Applications

Whether you have need for a fixture or not, a description of the fixture and how it works may shed some light on the generating process and show how it differs from an operation where the form on the tool is reproduced on the part. The process is rather complicated, and the fixture can show the operation of a hob without having to make a sample tool. It enables the engineer to know, in advance of the actual cutting operation, the form which will be produced by a given hob tooth form. It is also used to develop the hob tooth form when the part tooth form is established.

There are many reasons why it might be desirable to know what form will be produced. Designers may want to actually generate the part tooth form in order to obtain the best form for a particular application. This is especially advantageous when working with parts other than involute gears, such as ratchets, sprockets, pump gears, etc. When the part print is turned over to the production department, it may be desirable to generate the hob tooth form to determine if the part can be hobbed satisfactorily. The fixture is particularly applicable to fine-pitch gears because the amount of enlargement is much greater than for coarse-pitch gears. Also, the generating fixture provides an excellent means for training personnel in understanding the action of a hob as it produces the part.

There are many problems which the generating fixture can help to solve. We have chosen only a few and are including actual examples as produced on the fixture. In all examples, the hob tooth form is shown on the gray paper, and the part tooth form is shown on the white paper.

It is usually a simple matter to determine if a hob will produce undercut on the part, particularly in the case of involute gears. However, it may be desirable to determine the amount of undercut and where it starts on the profile. The fixture provides a graphic presentation of the tooth form showing the amount of undercut and where it begins.

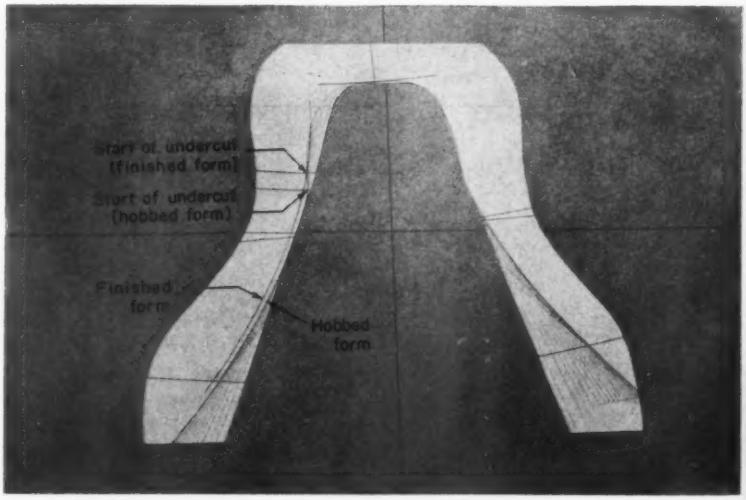
Sometimes it is necessary to maintain a given true involute form diameter and also keep the root diameter with a certain size fillet radius. The fixture can be used to determine if this is possible. In addition, when the gear is cut minus on the over-pin dimension, the effect on undercut, true involute form, or fillet radius can be determined.

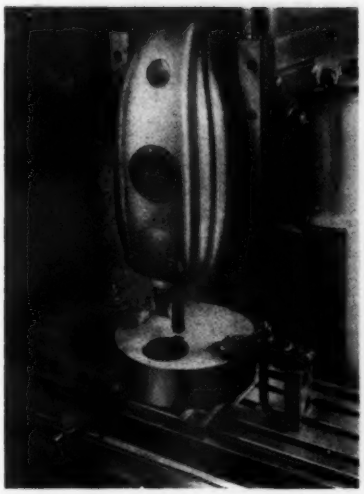
For design purposes, it is often desirable to know if mating gears will roll together without interference. Generate the conjugate rack tooth form from one of the part tooth forms. Using the rack tooth form, generate the mating part tooth form. Gears designed in this manner will roll together without interference.

It is sometimes advantageous to

. . . Continued on page 58

Fig. 2. A protuberance hob is used to produce undercut on this pre-ground pinion. The drawing produced on the generating fixture locates both the hobbed and the ground T.I.F. diameters. It also shows the amount of undercut before and after grinding.





The Shaping Attachment adds shaping and slotting to the variety of milling jobs handled by the Toolmaster. (Photos courtesy Bennett Metal Products, Wilmington, Ohio)

Accurate boring or drilling is easy with the help of Toolmaster's many BIG*-machine features. Toolmasters are available in these four styles:*

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1E-1 hp drive, manual or power feed to quill

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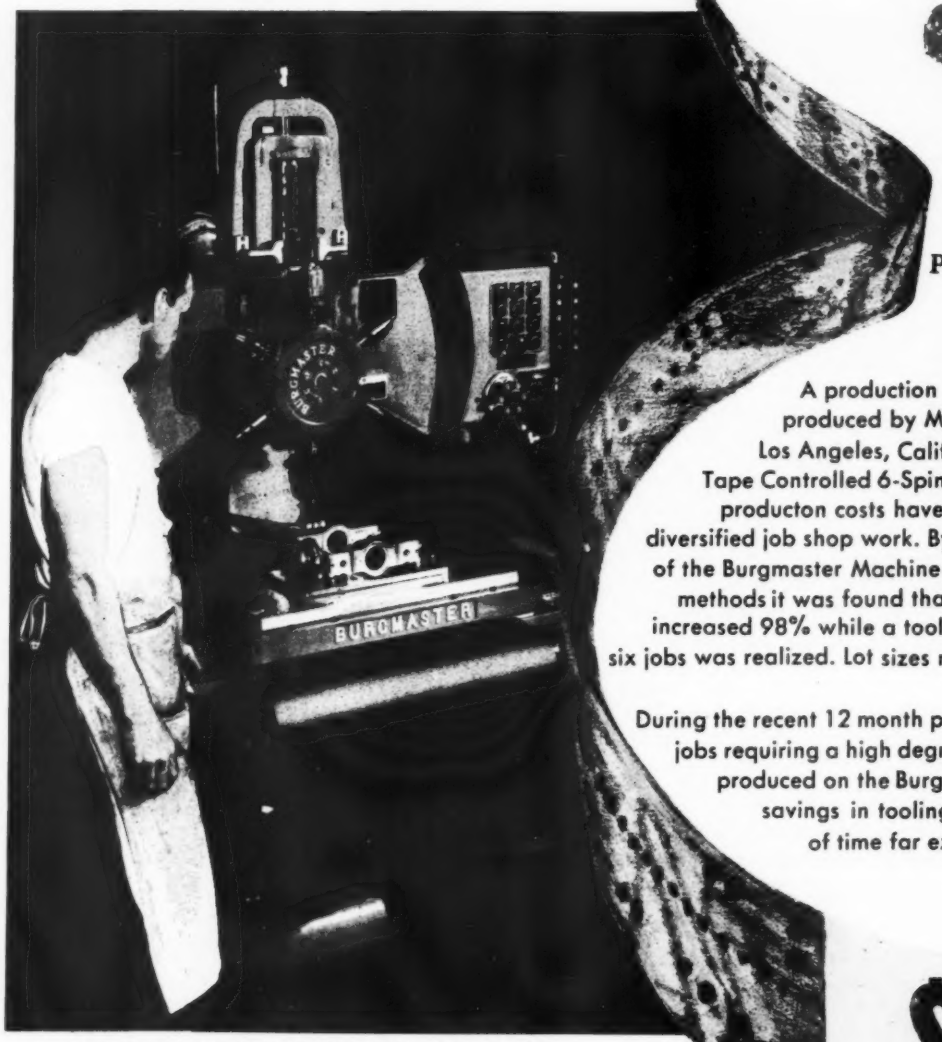

$3260 SAVINGS

$165 COST

TOOL SAVING ALON PAY FOR MACHIN IN LESS THA 1 YEA

A production analysis of six typical j produced by Mechanical Specialties C Los Angeles, California on their Burgmas Tape Controlled 6-Spindle Turret Drill shows t producton costs have been sharply reduced diversified job shop work. By comparing the operat of the Burgmaster Machine with conventional drill methods it was found that average production w increased 98% while a tool savings of $3260 for t six jobs was realized. Lot sizes ranged from 1 to 50 pc

During the recent 12 month period, over 100 diversifi jobs requiring a high degree of precision have be produced on the Burgmaster at this plant. T savings in tooling costs alone in this len of time far exceed the cost of the To Controlled Burgmast

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Parts are produced faster and to greater precision because all machine functions are controlled by tape, eliminating the human factor. The positioning table locates the work under the turret within ±.001" for each operation. During each turret index, the spindle in the working position automatically shifts to the preselected standard machine settings of speed, feed and depth of cut.

THE MACHINE TOOL

MMT-PE

Booth 840

Exposition - 196

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Six-Spindle Turret Drill

(at mechanical specialties co., los angeles)

14 holes include c-drill, drill, c'bore, chamfer and tap. Savings: tooling 7 hrs./75 hrs., machine time: .4 hrs./ 1.8 hrs.

28 holes in 2 setups include c'drill, drill, c'bore, chamfer and tap. Savings: tooling 3 hrs./115 hrs. machine time 1.2 hrs./3.6 hrs.

10 holes in two setups include c'drill, spotface, drill and tap. Savings: tooling 5 hrs./ 90 hrs.

9 holes include c'drill, spotface, drill, tap and bore. Savings: tooling 4 hrs./30 hrs., machine time .7 hrs./ 1.1 hrs.

50 holes include c'drill, drill, c'bore-chamfer, and bore. Savings: tooling 8 hrs./215 hrs., machine time 1.7 hrs./ 2.8 hrs.

140 holes in 6 setups include c'drill, drill and tap. Savings: tooling 6 hrs./ 120 hrs., machine time 2.3 hrs./4.5 hrs.

SIX TYPICAL JOBS SHOW SAVINGS ON TAPE CONTROLLED BURGMASTER COMPARED TO CONVENTIONAL DRILLING METHODS.

PRODUCTION DATA CHART

Part No.	Part Name	BURGMASTER TAPE CONTROL				CONVENTIONAL DRILLING			No. of Setups	No. of Holes	Operation
		Program and Punch Tape Hrs.	TOOLS Hrs.	TOOLS $	Mach. Time Hrs.	TOOLS Hrs.	TOOLS $	Mach. Time Hrs.			
1	Valve Body	.5	7	35.00	.4	75	375.00	1.8	1	14	Ctr Dr Dr Ch C'br Tap
2	Hyd Cont. Valve Inlet	3.1	3	15.00	1.2	115	575.00	3.6	2	28	Ctr Dr Dr Ch C'br Tap
3	Missile Component Ring	.8	5	25.00	1.4	90	450.00	1.4	2	10	Ctr Dr SF Dr Tap
4	Ring for Missile	.6	4	20.00	.7	30	150.00	1.1	1	9	Ctr Dr SF Dr Tap Bore
5	Computer Rail	.7	8	40.00	1.7	215	1075.00	2.8	1	50	Ctr Dr Dr CB-CH Bore
6	Gimbal	4.1	6	30.00	2.3	120	600.00	4.5	6	140	Ctr Dr Dr Tap

Write for Bulletin describing Burgmaster 6 and 8 Spindle Tape Controlled Turret Drilling, Tapping and Boring Machines. Forty-minute 16mm sound film showing all Burgmaster Turret Drills in operation is available without charge.

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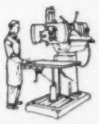
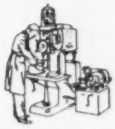
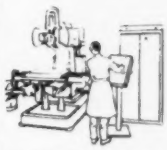


2BR Ram Type Radial Drill ¾" Capacity

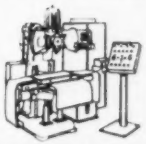


2BH Automatic Hydraulic ¾" Capacity

3BH Automatic Hydraulic 1½" Capacity



25AH Automatic Tape Controlled 1¼" Capacity



2BHT-3BHT Automatic Tape Controlled ¾" and 1½" Capacity

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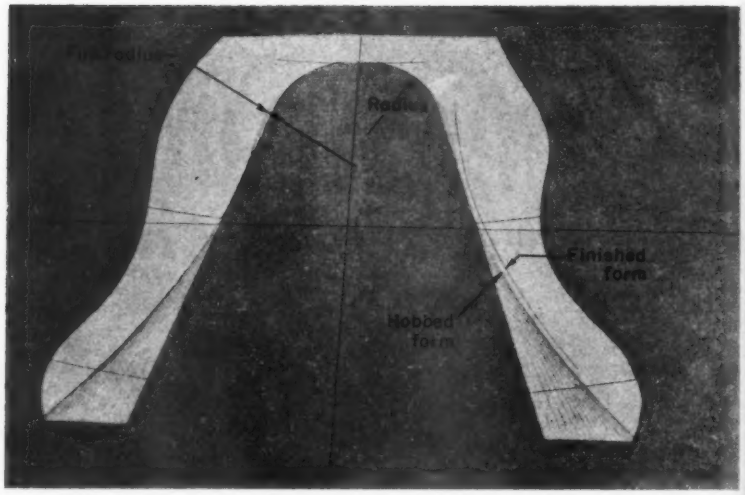
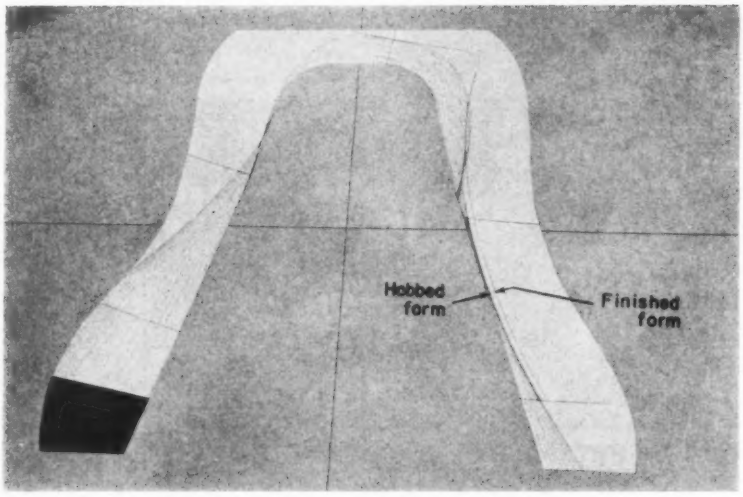


Fig. 3. The gear tooth form on the right was generated by a hob tooth to produce a full radius at the root of the gear tooth space. For the same gear, a protuberance hob tooth was used to produce the undercut gear tooth form shown below.



know the size of the generating flats which will be produced by a hob with a given number of flutes. Determine the generating length of the hob, and figure the number of hob teeth which will finish a gear tooth profile. Determine the arc which is subtended by the generating length, and divide the arc into equal angles according to the number of teeth which finish the profile. Rotate the gear on the fixture through these equal angles to find the size of the generating flats.

In some cases, it may be desirable to know if a semi-topping hob can be used for a different number of teeth. The chamfer on a gear produced by a given hob tooth form will change as the number of teeth or helix angle varies. However, the same hob may produce a satisfactory chamfer with a change in number of teeth or helix angle. This can be checked without cutting a part by generating the form on the fixture. The amount of enlargement can be controlled so that the size of the chamfer can be easily and accurately measured.

In addition to gear design, a generating fixture may prove advantageous to generate the hob tooth form prior to ordering the hob. This provides assurance that the correct hob is ordered. Many times, we find when we generate the hob tooth form on our own fixture that it is not feasible to make a hob for the part. In this case, there must be correspondence with the customer and ultimate delay in the delivery of the tool.

Operation of the Fixture

The generating fixture works on the principle that the hob tooth form can be considered to be the same as the rack tooth form in most cases, and it operates like a gear rolling on a rack except that the teeth have been removed. The diameter of the disc is the generating pitch diameter of the part, and the horizontal base line is the pitch of the basic rack. The disc must roll along the base line without slipping. It is held in intimate contact with the base line by two thin wires leading from either end of the disc to the tension adjusters on either side of the base.

On the hob layout sheet, draw a vertical line down the center of the sheet and a horizontal line across the center of the sheet. The horizontal line represents the pitch line of the hob. Lay out the hob tooth form to the magnified dimensions, keeping the tooth centered on the horizontal and vertical lines. Carefully cut out the outline of the hob tooth. Then cut and remove about one inch of paper adjacent to the hob tooth. This forms an enlarged template of the hob tooth which is used to generate the part tooth form.

On the gear layout sheet, draw a vertical line down the center of the sheet and a horizontal line across the center. Place the sheet on the generating fixture with the upper corners under the aluminum washers on the disc. Line up the vertical and horizontal lines on the

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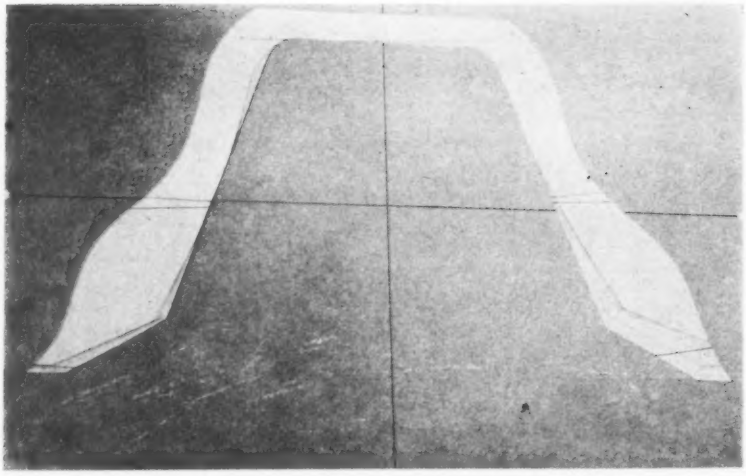

Fig. 4. The size of the chamfer produced by a semi-topping hob can be determined on the generating fixture.

paper with the vertical and horizontal lines on the fixture. Place the hob layout sheet over the gear layout sheet with the lower corners under the washers, and line up the vertical and horizontal lines with those on the gear layout sheet.

Remove the pin from the disc, and roll the disc to the extreme right or left position. Draw a line around the hob tooth template. Roll the disc a small amount, and draw another line around the hob tooth template. Repeat this process, moving the disc a small amount each time, until the disc has been rolled to the opposite side and the part tooth space is completely formed.

The generated form can be analyzed by using trammel points for measuring. To convert back to the original size, divide all measurements by the magnification.

To determine the hob tooth form from the part tooth form, magnify the gear tooth space, lay it out, and remove material along the edge to make a template. Place the gear layout sheet over the hob layout sheet, and proceed as outlined above. The series of outlines of the gear tooth form will produce the form of the conjugate hob tooth.

To find the form of helical gears in the transverse plane when the hob tooth form is known, convert the hob tooth form to the form in the transverse plane by dividing each plot point along the hob tooth profile by the cosine of the helix angle. Plot the new hob tooth points, and generate the part tooth form as above. An approximate method for determining the form of helical gears in the normal plane is to find the equivalent number of teeth and equivalent pitch diameter and then generate the form the same as for a spur gear.

Included with the fixture are five micarta discs with radii of 15″, 30″, 60″, 120″, and 240″. The working edges of the discs are accurately ground. Each of the discs is marked with a line from its theoretical center to the outside edge. When a disc is placed on the fixture, the lines on the disc and the base are aligned when the disc is in its zero position. It can be locked in this position by inserting the pin in the top of the disc.

The disc to be used for a particular job depends upon the amount of magnification desired. This indicates the size of drawing paper to be used. Normally, the drawing paper is either 12″ x 18″ or 18″ x 24″. It is recommended that the dedendum of the hob tooth form be approximately 5″ in height on the 12″ x 18″ paper and 8″ on the 18″ x 24″ paper.

Example

As an example, let us assume a gear with 15 teeth, 10 D.P. and a pitch dia of 1.500″ (0.750″ pitch radius). The whole depth is 0.2157″. To find the size of the magnified tooth, divide the radius of the disc by the pitch radius of the gear and multiply by the actual whole depth. For this example, we will assume that the drawing paper is 18″ x 24″, and the magnified tooth size should be approximately 10″.

First, we will try the disc with the 15″ radius.

$$\text{Enlarged whole depth} = \frac{15}{0.750} \times 0.2157$$
$$= 20 \times 0.2157$$
$$= 4.314''$$

Since the enlarged whole depth should be approximately twice this size, we will use the 30″ disc, giving an enlarged whole depth of 8.628″. To lay out the hob tooth form for this example, all elements of the form must be enlarged 40 times.

$$\text{Hob addendum} = 0.1157 \times 40 = 4.628''$$

$$\text{Hob dedendum} = 0.1000 \times 40 = 4.000''$$

$$\text{Hob tooth thickness} = 0.1571 \times 40 = 6.284''$$

$$\text{Hob tip radius} = 0.0157 \times 40 = 0.628''$$

Lay out the hob tooth form to these dimensions, and generate the gear tooth form. All elements of the enlarged gear tooth form must be divided by 40 to determine the actual dimensions.

Extra copies of this article are available while supply lasts. Write Tooling & Production Magazine, 1975 Lee Rd., Cleveland 18.

Reprints of the Engineering Report on

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from the June T&P are available.

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Turret

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At The Goss Company, a division of Miehle-Goss-Dexter, Inc., Chicago, tape control machining plays an important part in the over-all production operation.

For instance, this J & L tape-controlled positioning table, equipped with a standard column drill press, has achieved an average of 30 to 40% savings in floor-to-floor time on every job assigned. One job, involving drilling and reaming of small malleable iron transfer roll adjusting plates, was transferred from a conventional sensitive drill press setup to the J & L machine. Job lots consisted of only four pieces.

The old setup required 3.1 hours production time for each lot. Using tape control, with a simple locating and clamping setup, Goss has been able to cut this time to 1.7 hours—a saving of 1.4 hours per lot, or more than 45%. Hole location is more accurate too, because J & L tape control consistently holds tolerances of + or — .001". With the old setup, it was difficult to hold hole locations to less than .010" on layout jobs of this size.

Investigate how *production-proven* tape control units can help increase the efficiency of *your* operation. Write to Jones & Lamson Machine Company, 519 Clinton Street, Springfield, Vermont for folder 5902, "Tape Control Positioning".

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CIRCLE INFORM-A-GRAM KEY NO. 61

SUB-ZERO Temperatures

. . . tools for material processing

by T. J. Frederick

Mr. Frederick is chief engineer at Cincinnati Sub-Zero Products, Cincinnati, Ohio.

Sub-zero operations ease the production of many of today's products, in many cases improving them and lowering their manufacturing costs, as well.

STABILIZATION OF METALS and expansion-assembly are two of the main uses of low-temp engineering. Results of a recent survey are shown in Figure 1. The survey was made to determine the major industrial uses of "cold" processing and to illustrate the temperature range of each. Besides this, the survey showed that throughout Industry R&D programs are demanding the use of extremely accurate and versatile high-and-low temperature equipment.

Many of the environmental chambers are small, having a 2-4 cu ft capacity — although the need for large walk-in chambers is increasing. The most common requirements of an environmental chamber are that it produce temperatures from −100°F to +300°F, with 20 to 95% relative humidity. They must simulate atmospheres similar to those up to 200,000′. Other chamber requirements call for temperatures as low as −325° and as high as +500°F.

Ultra Low Temperatures

Special research, particularly in relation to the development of missiles systems, is creating an ever increasing need for ultra low temperature equipment to simulate space conditions. Environmental chambers with standard refrigeration systems can be manufactured for low temperature pull-down to approximately −250°F. Whenever lower temperatures are required, researchers use liquid nitrogen, helium, or hydrogen as refrigerants. Or, products can be subjected to near absolute zero (−459.6°F) in baths of cryogenic mediums within a cryostat or similar chamber. In this instance, gases are compressed and then al-

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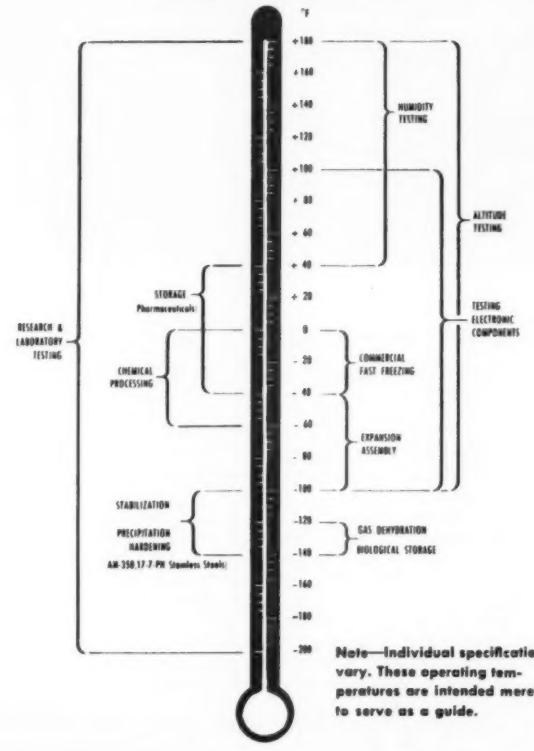
Figure 1.

TEMPERATURES FREQUENTLY USED FOR VARIOUS APPLICATIONS



Note—Individual specifications vary. These operating temperatures are intended merely to serve as a guide.

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Two-dimension tracing eliminates secondary operations and reduces costly "off" machine time

Two-dimension tracing, combined with conventional turret lathe tooling, provides an extremely versatile method for complete machining to tight specifications.

For instance, the end use of the connecting rod bolt (illustrated above) demands extremely fine finish to eliminate the starting of fatigue cracks. In addition, relief surfaces, O.D., head faces, and threaded end must all be square and concentric. Radii of fillets connecting the different diameters must be smooth and free from scratches. Two reliefs, each 6½″ in length, must be held to + or — .002″ and to 40-50 RMS to eliminate subsequent grinding operations. The finished parts are 19-3/4″ long with different O.D.'s varying from 1-1/2″ to 2-7/16″. The material is tough: AISI 4140; Brinell 241.

All this is accomplished in one tooling set-up on a J&L turret lathe with a two-dimensional tracer. Floor-to-floor time for finished parts is less than three minutes on the head end, and less than nine minutes on the shank end. Write for Folder #5903.

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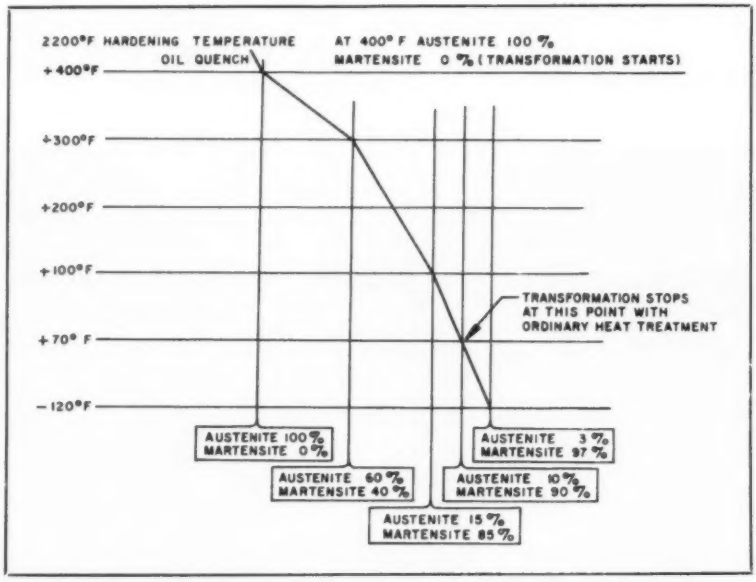


Fig. 2. Stabilization of steel can be obtained in a matter of hours through sub-zero chilling. This quick aging is the result of the transformation of austenite to martensite.

lowed to expand into the chambers; as they expand they take on heat, creating the near-absolute temperatures.

Stabilization of Steel

The greatest call for sub-zero equipment is in metalworking, particularly among fabricators of steel products requiring size stability.

In their heat treated form many steels are not completely stable. They retain a certain amount of austenite after routine heat treating where they are heated above their critical temperatures. Heat treated the usual way, metal alloying elements — carbon, iron and others — go into an austenitic solution. This is an unstable structure that partially transforms into martensite during quenching and tempering. Martensite is a tougher and more ductile substance than austenite.

While complete transformation is the ideal condition, it is never completely accomplished (Fig. 2). Even with good control, as much as 10% austenite may be retained. Retained austenite will continue its transformation to martensite through exposure to varying weather conditions, and a complete transformation will result in time — aging. But this may take as many as seven years for a complete transformation.

For various reasons final machining should not take place before a complete transformation. The most important reason for this is that during the transformation the metal may warp, grow, or distort, since austenite has a smaller volume per unit weight than martensite. It is obvious then that complete transformation, in the shortest possible time, is desirable.

One method of doing this is with the use of sub-zero equipment, by which the natural aging process of several years can be accelerated to a matter of hours. Most steels can be almost completely transformed in the temperature range of —120° to —150°F (Fig. 3).

In addition to giving greater dimensional stability, the complete transformation gives the advantage of a tougher, more ductile, steel with improved life characteristics. Also, the steel may become several points harder on the Rockwell "C" scale, depending on the steel involved.

Steel Aging Applications

When stabilized at —130°F, bearing components will permanently hold tolerances and assure the lowest possible coefficient of friction. This will be true no matter how severe or varied the operating temperatures.

When chilled to —100°F, stainless steel aircraft parts will achieve greater hardness with reduced forming time.

Machine beds, arbors, mandrels, and gages can be quickly and effectively stabilized so they will better retain size during use.

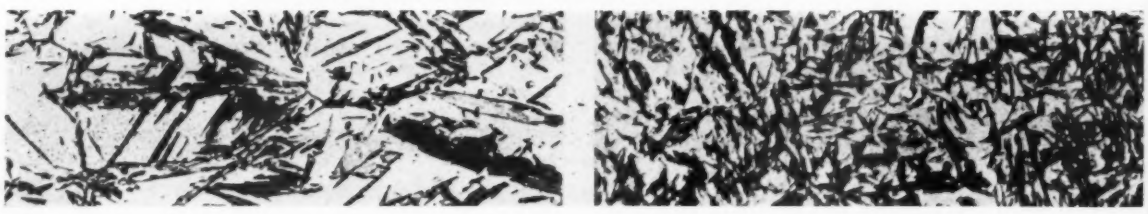
Lapping flats, for gage finishing, will maintain their accuracy for several days after stabilization. This is in contrast to only several hours life without stabilization.

Hacksaw blades, sub-zeroed at —120°F, have given more than 113% longer life.

Welding tips, after cold treatment, have given 100% more welds per cleaning. In addition,

. . . **Continued on page 66**

Fig. 3. A 700X photomicrograph (left) of an unchilled sample. The martensite with retained austenite is clearly defined. A 700X photomicrograph (right) taken after chilling showing that austenite has almost completely changed over to martensite.



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Three different table styles are available, including a fixed table for straight comparison work, a plain table, and a measuring table which gives you 6 square inches of measuring area. All measurements are read directly to .0001", without computation.

Among other things, the TC-10 is adaptable for *reflection inspection*. Reflected images are extremely sharp—even at high magnifications.

Other "big machine" features include Angle Measuring; Quick-Change Lens Mount; Vertical Staging; Tracing Inspection. And there's a big bonus in the 5X, 2" aperture lens, which gives inspection capacity and accuracy hitherto unattainable on a machine of this size. Write for folder. Jones & Lamson Machine Company, 519 Clinton St., Springfield, Vt.

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the welds are stronger.

High speed taps benefit from this treatment too. In one case only 5 to 20 holes could be made without sub-zero processing. Following this treatment, 250 holes were tapped before replacement.

Many other applications could be mentioned where subjecting the metal to low temperature improves its performance.

Stress Relief of Aluminum Castings

Like other metals, aluminum alloys can be normalized through exposure to sub-zero temperatures. "Soaking" castings and forgings for 2-3 hrs at —120°F is beneficial. Close fitting aircraft parts that often seized or failed to operate at high altitudes are made more dependable.

One company had difficulty with heat treated aluminum castings. To live with the situation, tool engineers specified a 24-hr wait between each of three machining operations. This required three setups. Now, with the use of chilling facilities, these parts are set up only once for their complete machining — they now rough machine and then immediately finish machine. In this instance, where several hundred castings were being processed, $40,000 was saved due to reduced handling. The same technique is now being used on bronze castings.

Arresting Age Hardening

Many aluminum alloys have the characteristic of changing in strength and workability while sitting around at ordinary room temperatures. Aging this way takes most aluminum about four days. While the increased strength is desirable, it is accompanied by considerably less workability. Refrigeration to delay natural age hardening greatly speeds production. There is also reduced fabricating cost and the opportunity to use more convenient fabricating practices.

The treatment does not alter an alloy's properties but it does keep it "soft" and workable. For instance, prior to heading aluminum rivets many manufacturers retard the aging process by storage at low temperature. Rivets can be kept indefinitely at —40°F to —100°F and any that are not headed within 1 1/2 to 2 hrs after removal from storage can be treated again to permit satisfactory heading.

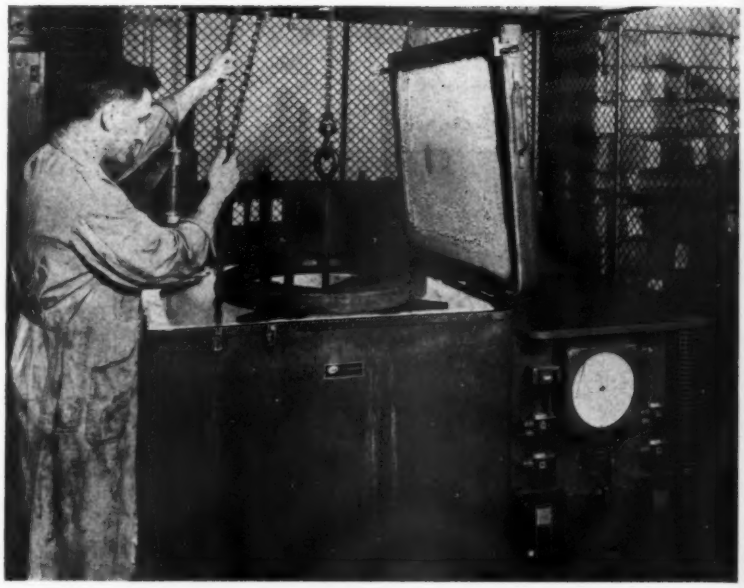

Fig. 4. Expansion assembly operation of an alloy and stainless steel part for a jet engine. Note handling ease.

Simplified Assembly Procedures

The common practice of shrink-fit assembly is often worked in reverse with the use of refrigeration equipment. Expansion-assembly, the reverse, is found to have many advantages over shrink fit.

For instance, problems can result from heating up a female part prior to shrinking it around a male part. The high temperature may cause metallurgical changes resulting in distortion, reduction of hardness, oxidation, and general scaling. And, the force required to complete an assembly, may lead to physical damage.

On the other hand, expansion-assembly, where the male part is shrunk for insertion, eliminates many of these problems — mainly because chilled parts are not metallurgically changed or otherwise damaged by the cold. In addition, cold parts are easier to handle than hot parts, and pressing is not required for assembly.

Improved Products

In the manufacture of molded rubber bushings (and similar items), low temperatures are the answer to difficult flash removal problems: Rubber parts are frozen and tumbled in a low temperature chamber, where the flash becomes brittle and readily breaks away.

Cold equipment is also required in the manufacture of transistors. The transistors are cycled several times from high to low temperatures, which gives them the stability and long life necessary for critical electronic instruments and assemblies.

Another instance finds instrument manufacturers using cold equipment to improve magnet steel. Certain steels do not exhibit satisfactory magnetic properties until given a sub-zero treatment prior to magnetizing. After freezing for 4 hrs at —120°F they are drawn at +300°F for 1 hr and then magnetized.

Conclusion

While there is still debate on the methods of creating low temperatures, it is a sure thing that sub-zero temperatures will do more and more for Industry.

Extra copies of this article are available while supply lasts. Write Tooling & Production Magazine, 1975 Lee Road, Cleveland 18.

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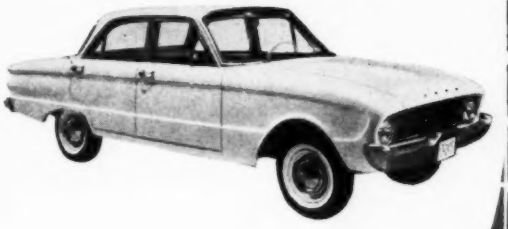
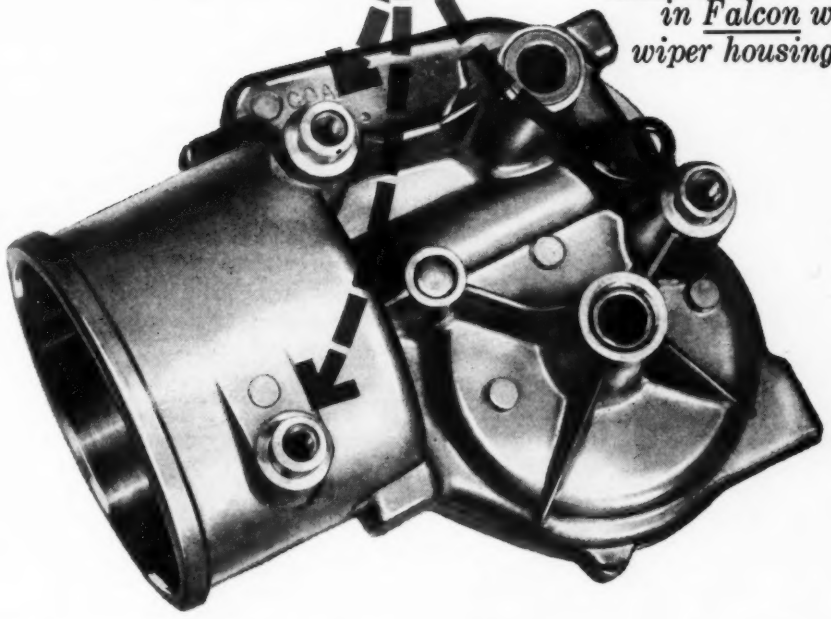
BESLY X-PRESS TAPS Speed-form internal threads in metals such as copper, brass, die castings, aluminum, lead, leaded steels and other ductile materials. They are available in standard tap sizes and various styles for through or bottoming holes. Patent No. Re. 24,572. Other patents pending.



when Besly X-Press® Taps speed-form internal threads in Falcon windshield wiper housing!



Ford Motor Company's *Falcon* will give you good forward vision in rain, snow or sleet with its powerful windshield wiper.

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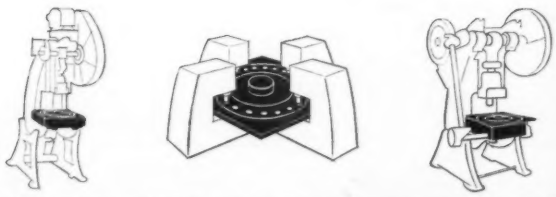

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Some Advantages of Hydraulic Equipped Dies

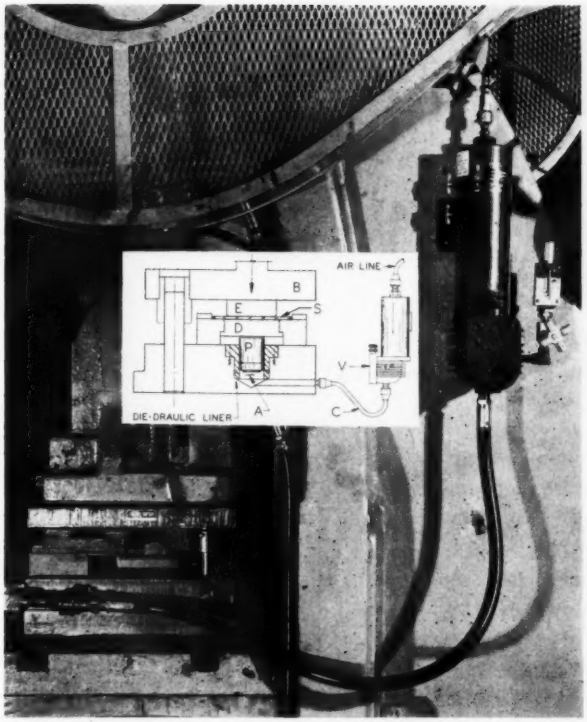

Fig. 1. A Die-Draulic unit mounted on the side of a press. Lower hose transmits hydraulic pressure to piston through porting in die.

ADEQUATE PRESSURES for die pads are more easily obtained with hydraulics—a "stout" aid to die designers. The use of hydraulic die cushions offers the unique advantage of full required pressure from the start of pad movement.

This system, as you know, involves the use of small cylinders placed strategically within the die. Through the die, the descending press ram pressurizes the oil under cylinder pistons as shown in Figure 1. Desired pressure, arranged by the control valve, remains constant throughout the strokes as oil is metered into reservoir.

At the end of the downstroke, pistons are returned to start by compressed air from the plant system. Air pressure is constantly applied over the reservoir oil and is often used to strip the part. A simple device for increasing reservoir pressure to 300 psi can be added if more stripping pressure is needed.

A recent development by Die-Draulic Grip Inc. offers oil recirculation, whereas an oscillating arrangement was previously used. By recirculation, a cooler operation occurs; on some applications, where heat is extreme, the former system is impractical. For applications where heat is excessive, the oscillating type can also be equipped with a water cooled valve and reservoir. However, special cooling is usually not necessary.

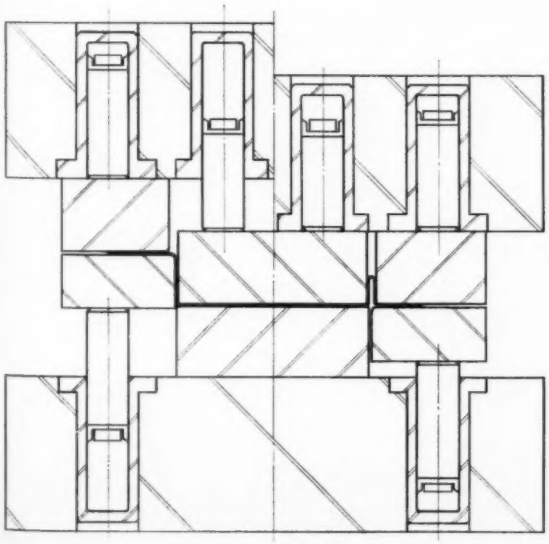

Fig. 2. By using hydraulic cylinders, in place of springs, this reverse draw is more easily accomplished.

One nemesis of other systems used for pad holding is lack of pressure, or uneven pressure, which permits wrinkling. Usually, based on applied pressure of around 2500 psi, the size and number of pistons are chosen to match the total force required. Should calculations be in error, the pressure can easily be adjusted within a wide range—from 100 to 4500 lb. Correction is not this easy when other pressure systems are used.

Many applications, such as the one in Figure 2, use hydraulic pres-

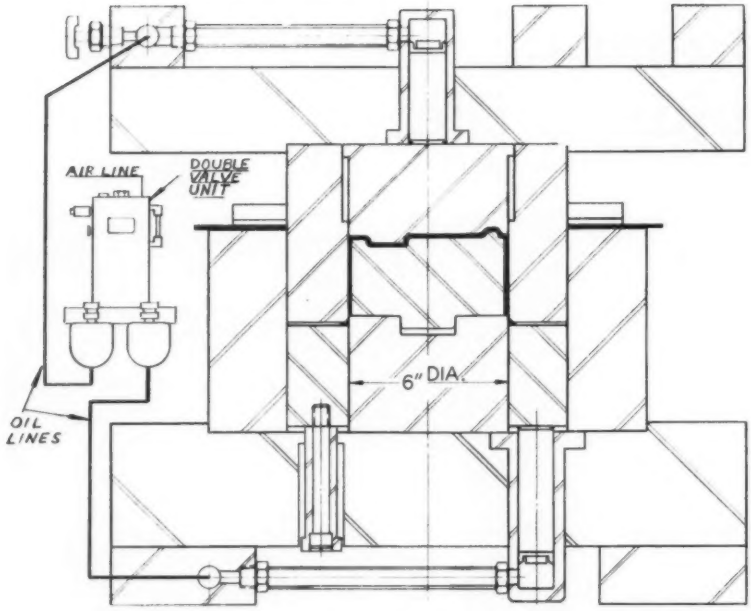

Fig. 3. A two-valve Die-Draulic unit makes possible blanking, embossing, drawing and pinch trimming—all in one stroke.

sure pads. Large parts, like washer tops and refrigerator and automobile components, may be made in dies so equipped.

If two different pressures are required, say in the upper and lower portion of a die or in stages of a progressive die, two valves may be used. Each valve can be set for the precise pressure requirement in the respective stages. Figure 3 shows a two-valve unit applying pressure to upper and lower portions of a die which blanks, embosses, draws, and pinch trims a part in one stroke. Here the part is preformed against hydraulic pressure before the sides are drawn.

Sometimes an operation can be eliminated if reverse bending is used, as in Figure 4. Here the curling on the upstroke would have required another die if springs had been used.

An application such as the forming of the beads in an oven liner is just one of many jobs more easily handled by hydraulic pressure. The die arrangement in Figure 5 shows this. Stock is pulled from the ends as beads are formed progressively. Besides other advantages, the system should be considered for press overload protection. Toggle action may be obtained from a single-action press with this arrangement.

Punch overload protection can also be achieved by this system. Where piercing die components are subject to breakage from inserting multiple parts, out-of-tolerance stock, or slug blockage, you are safer with hydraulic pressure. It is safer, too, since hydraulic pressure equipment requires far less space and complication than a conventional cam arrangement. The operator has a "cleaner" area for inserting and withdrawing parts.

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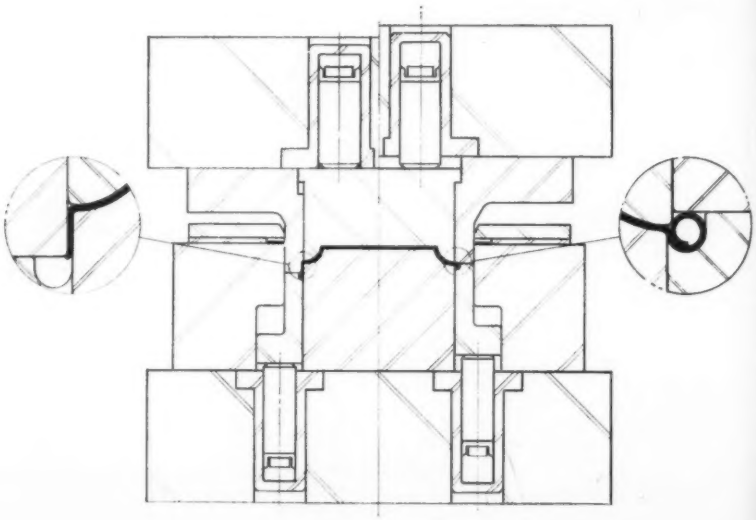

Fig. 4. Blank, form and draw are performed here as well as curling on the upstroke. With springs this would normally be a two-operation job.

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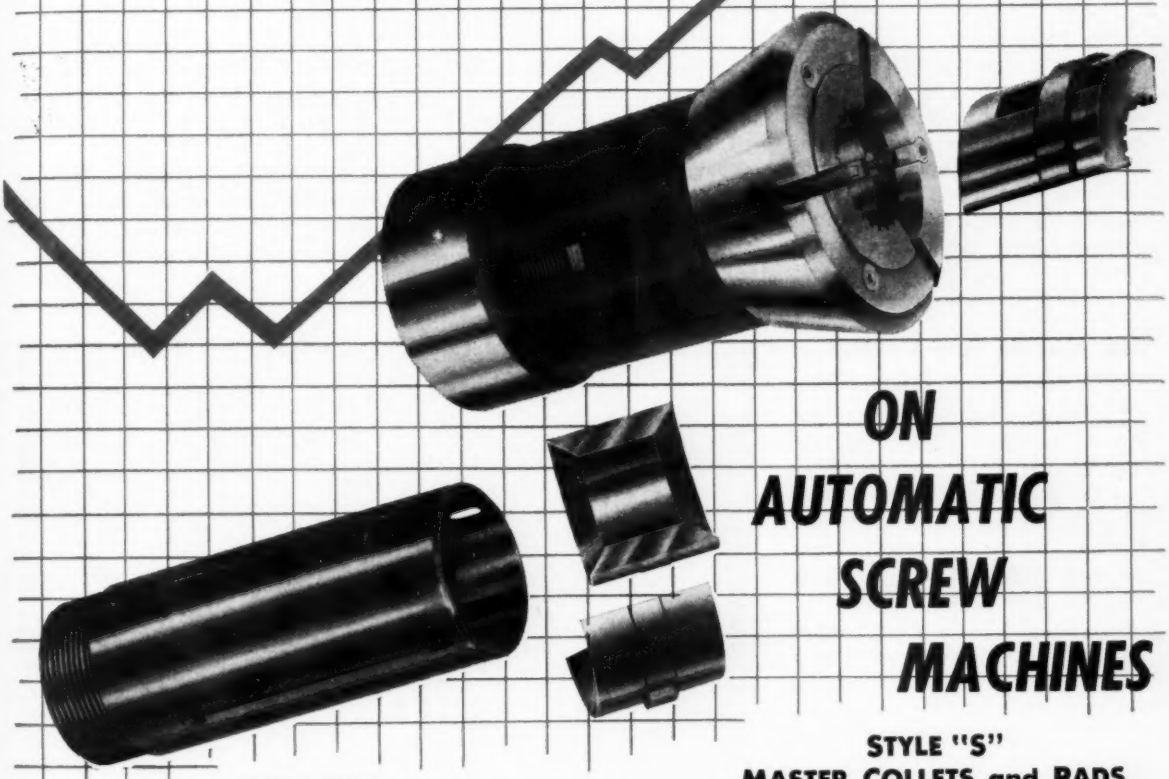

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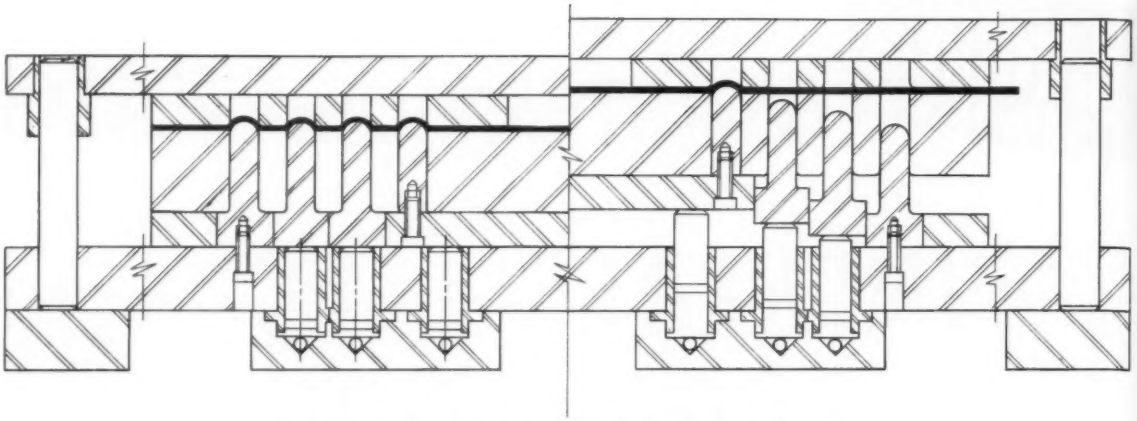

Fig. 5. An oven liner is held by hydraulic pressure as stock is pulled from the sides. Starting from center out, two beads are formed successively.

Should the part to be pierced be bulky, odd shaped, or not lend itself to operation in a press, piercing, lancing, etc. may be performed without one by applying hydraulic power with a Die-Draulic Multi Unit, or a similar air-hydraulic booster. These are also used for handy piercing after a stamping operation when used close to the press, thus saving transfer.

Like other developments, once a designer is familiar with die-hydraulics it is quite simple to specify the exact equipment needed for a specific application. And, few high production shops can afford downtime caused by broken springs.

—WEH

Extra copies of this article are available while supply lasts. Write Tooling & Production Magazine, 1975 Lee Rd., Cleveland 18.

Six Heads Are Better Than One

Conversion of a used single-spindle vertical milling machine to a special six-spindle machine was the answer to the production needs of Lancaster Machine Knife Works. The rebuilt machine has cut production time on a variety of jobs at the company.

In one application, five spindles are used to mill twenty slots on a 110″ long knife blade. All of the slots were milled in 30 min, compared to 2 hrs with the old method of milling one slot at a time.

Six fixtures are used at the same time in another job, where oblong holes are machined. On a single-spindle machine, the job took 1-½ hrs; the six-spindle conversion does it in 20 min.

Starting point for the conversion was the purchase by Buffalo Machinery Co., Inc., of a #3 Cincinnati vertical milling machine. They rebuilt the machine. The vertical head was removed, and a rail was installed in the head column. Six heads, with centers adjustable from 3″ to 12″, were then mounted on the rail. The take-off mechanism from the original drive was changed, but the original speeds and feeds were maintained without changing the gear ratios to operate the six heads.

In August and September

Tooling & Production Previews the Chicago Machine Shows

Drilling and Turning Fixture Designs

by Federico Strasser
Santiago, Chile

A round-up of three fixtures which, in combination, present design details insuring quick-clamping, equalized holding, and precision alignment.

Drill Jig Design Features Quick Clamping and Equalized Holding

In this drill jig, designed for the drilling of holes in cast workpieces, we incorporated a quick-acting clamping device of rather original design. The tool is actuated indirectly by means of a wedge, and distributes uniformly the clamping pressure upon the two ends of the component. The clamping pressure, the same at both holddown points, is achieved automatically.

As seen in the accompanying drawing, Figure 1, the casting is put into the jig nest and the nut is tightened. Thus the wedge-rod is pulled out and the clamping bar pulls down on a horizontal movable beam, pivoted around the upper end of the bar. The beam in its turn applies the pressure on the bottom ends of two U-shaped pivoted straps. The top ends of the straps contact the upper surface of the workpiece and clamp it in the jig nest.

The self-adjusting, and equalizing function of the clamping device resides in the pivoting beam, which distributes the clamping pressure uniformly and automatically, regardless of the variations in thickness of the cast workpieces.

For removing the finished workpiece, it is unclamped by loosening the nut and pushing in the wedge-rod. The clamping bar is raised by means of the two compression springs which bear on the bottom ends of the straps. Thus, these are lifted and consequently the workpiece becomes free and can be easily removed from the jig.

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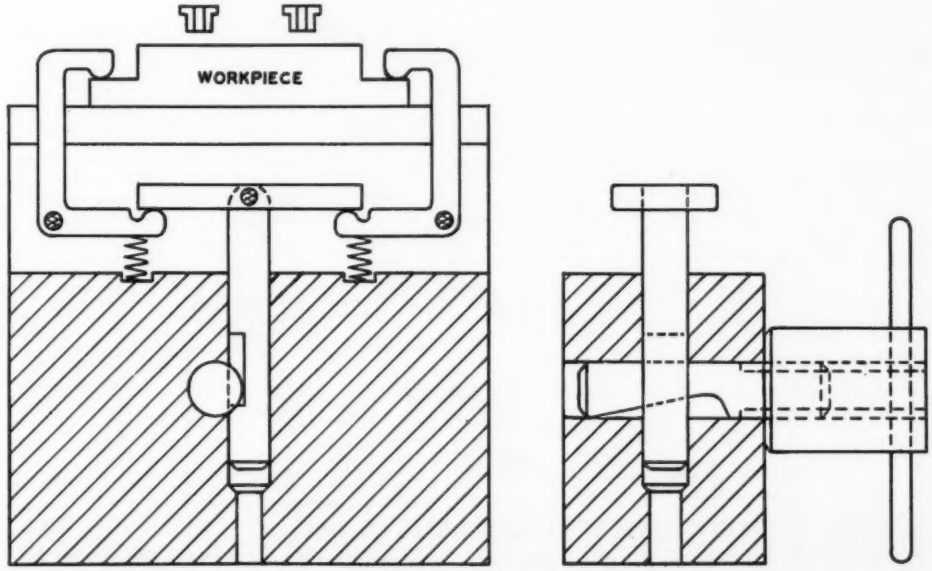

Fig. 1. The pivoted hold-down arms are equalized in clamping pressure by the self-adjusting cross beam. The compression springs act to quickly free the workpiece.

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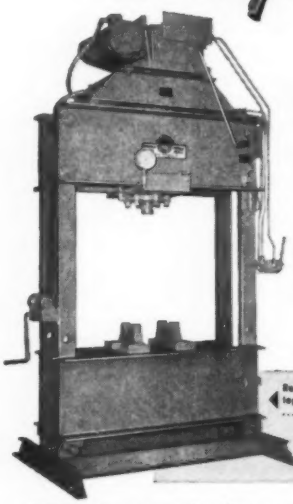

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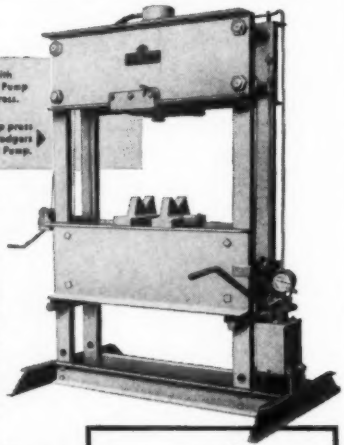
Rodgers 100 ton shop press with top mounted Greenlee Power Pump ...cylinder travels width of press.

Rodgers 100 ton shop press with Rodgers 2 speed Hand Pump.



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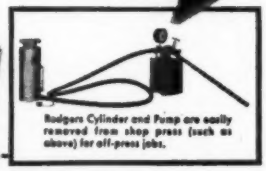

Rodgers Cylinder and Pump are easily removed from shop press (such as above) for off-press jobs.

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Gaertner Toolmakers' Microscope used to measure typical piece part. Co-ordinate range 4" x 2".

Precise measurement to 0.0001" and 1 min. of arc

Gaertner Toolmakers' Microscope

Here is a reliable, easy-to-use microscope for precise measurement of piece parts, tools, dies, thread gages, templates, jigs, fixtures, etc. Ideally suited for making a wide variety of precision measurements and is especially valuable in reducing rejects in production work.

With the Gaertner Toolmakers' Microscope you make direct, non-destructive measurements — no contact, no distortion, images are sharp and clear. It is a basic measuring instrument for inspection depts., gage labs, tool and die and model shops, industrial and research labs.

The Gaertner Toolmakers' Microscope has been proven in use by U. S. Government Gage Laboratories, and by prime contractors and their subcontractors. With all parties using the same measuring instrument, inspection procedures are co-ordinated and disagreements and rejects minimized.

Features that help you get
HIGH SETTING AND REPEATING ACCURACY

- Low, compact built-in rotary stage reads to 1 minute of arc throughout 360° range.
- Minimum overhang of stages.
- Full 2" precision-lapped lead screws with correction device.
- Straightforward, direct, uncomplicated optical system.

Features that assure you of
EASY, CONVENIENT OPERATION

- Independently rotatable cross hairs in protractor ocular speed up measurements, simplify measuring procedure.
- Convenient location of ocular eyepieces for ease of reading.
- Built-in transformer and plugs for all illuminators.

Modifications and accessories to
MEET YOUR EXACT REQUIREMENTS

- Thread and radius templates, camera and spotting attachments, fine motion focus, variable magnification available.
- If you have a special measuring problem, our staff of representatives will be happy to consult with you. The service and engineering facilities of the manufacturer are always immediately available to help you.

Write for Bulletin 147-56

Designed and manufactured by

The Gaertner Scientific Corporation

1242 Wrightwood Ave., Chicago 14, Ill.

Telephone: BUckingham 1-5335

CIRCLE INFORM-A-GRAM KEY NO. 743

Turning Fixtures for Large Rings

For turning quantities of comparatively large diameter rings, with comparatively weak cross sections (in relation to the diameter) it is not possible to clamp them with an ordinary 3- or 4-jaw chuck. In fact, the deformations caused by the clamping pressure are such as to result in unsatisfactory and rejected work.

In those cases where all four surfaces of the ring must be machined, i.e., outside and inside diameters turned and two sides faced, we use two fixtures. One handles the first operation and the other the final three.

The first fixture, Figure 2, is essentially a face plate which carries a concentric centering device and standard straps for clamping purposes. The second fixture, Figure 3, is a face plate where the centering is done simply by a turned groove; for clamping, special straps are employed.

The first operation (OD turning) is the most interesting one. The rough workpiece is approximately centered on the face plate and a self-centering device is utilized for locating the ring quickly and semi-automatically in a perfectly concentric position. The self-centering is accomplished by three plungers, 120° apart, actuated by the tapered surface of a central screw with a knurled head. By turning the screw in, the plungers move simultaneously outwards, and by exactly the same amount, so that the three outer ends of the plungers describe a concentric circle. The light pressure exerted by the plungers is not apt to deform the ring, yet it is perfectly sufficient to insure the correct alignment (centering) of the work.

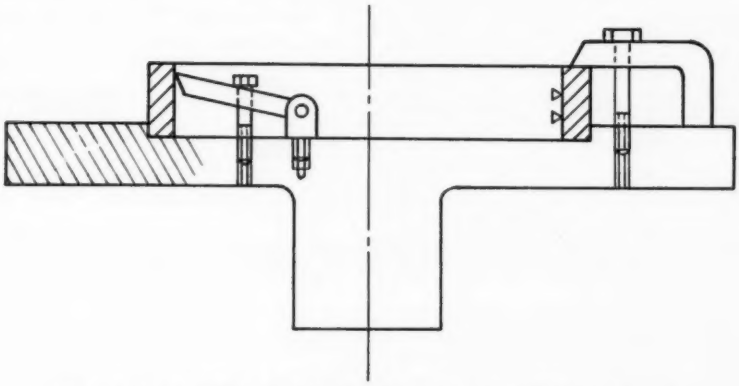


Fig. 3. For the final operations, this one face plate fixture serves for turning the ID and facing both flats.

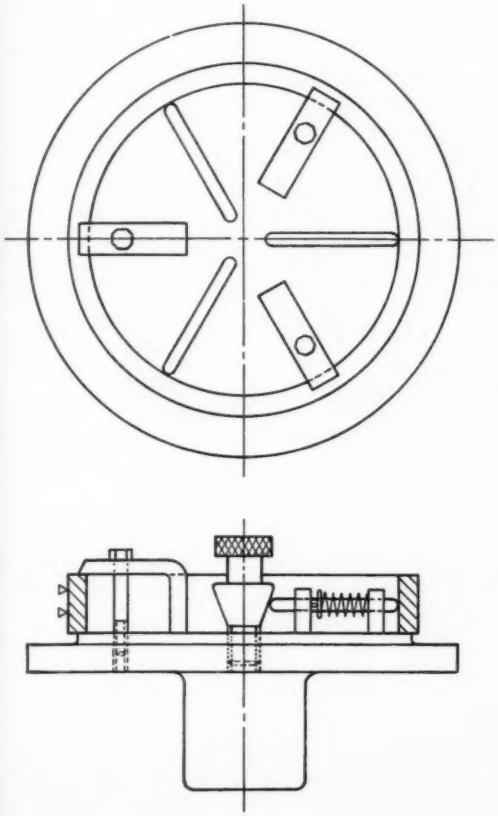


Fig. 2. This turning fixture, essentially a face plate, incorporates cam-actuated "push out" plungers which truly center the workpiece, and three standard hold down straps.

The clamping is effected by means of three standard straps fastened with hold-down bolts. The straps are located at 120° increments and at 60° from the plungers, Figure 2. Since the straps act in compression on the ring section, there is no deforming stress caused by the clamping.

After turning the outside to correct diameter, the straps are removed and the screw is run up so the plungers (actuated by light compression springs) retract and free the ring.

For the further three operations, the OD is taken as reference. In fact, the second fixture, Figure 3, is a large face plate, where a turned groove controls the correct centering of the workpieces.

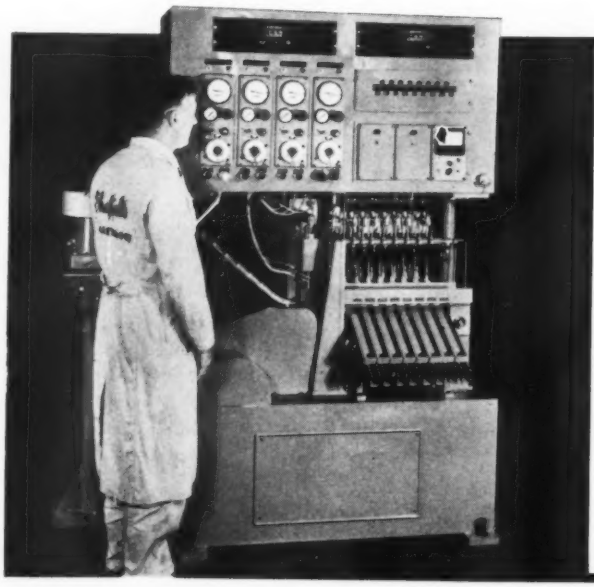
The clamping for the boring is done by means of standard straps, which secure the ring against the groove without any deforming tendency (see Fig. 3, right side). For the facing operations, special internal straps are provided (see Fig. 3, left side) which — when the clamping bolt is tightened — press the workpiece against the sides of the centering groove. end

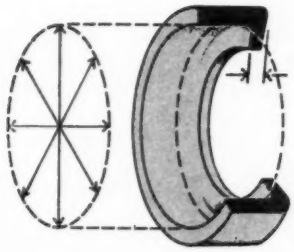
A **Sheffield sorter*** sorts 2000 rings an hour

2000 rings an hour a **Sheffield sorter*** sorts.

If a **Sheffield sorter*** sorts 2000 rings an hour

Where are the 2000 rings the **Sheffield sorter*** sorts?





*This Sheffield automatic gaging, classifying and segregating machine inspects up to 2,000 rings an hour for the Western Electric Company. It simultaneously measures inside diameter and flange thickness, classifies rings into 15 sizes plus out of tolerance, and rejects each size in its chute. Its speed and accuracy have resulted in appreciable manufacturing savings.

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CIRCLE INFORM-A-GRAM KEY NO. 76

Standard Rotary Pilot Bushings

By including standard rotary pilot bushings in machine tooling it is possible to increase output since the elimination of chatter and vibration permits exceptionally fast machining operations.

With the widespread adoption of new cutting materials, higher cutting speeds and heavier loads, these bushings further advance the more rapid production of finished parts. The bushings provide a smooth flow of power from the initial drive to the tool point.

Laboratory tests have proved the successful retention of a wide range of fluid medium and the exclusion of dirt and abrasives.

For complete details, sizes and specifications, write Standard Rotary Bushing Co., 18107 Invermere Ave., Cleveland 28, Ohio, or Circle Inform-A-Gram No. D1.

Belt and Disc Finishing Can Be Quick and Handy

This new combination belt and disc finishing machine is capable of performing 90% of all shop finishing operations, and is useful in shops of all sizes from the local automotive repair shop to the largest metalworking plant.

Taking a standard 4" abrasive belt and 12" disc, it was designed for use where custom or production finishing must be performed efficiently and economically.

It is excellent for grinding, surfacing or polishing steel components, die castings, aluminum, brass and copper parts and a variety of other materials, and can also handle finishing operations on wood and plastic.

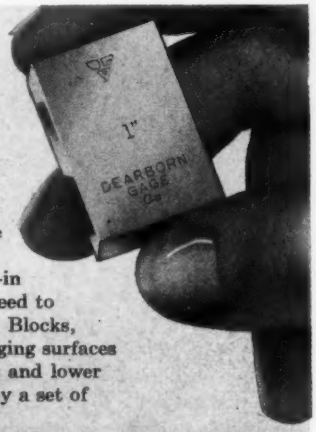
Tool sharpening by abrasive belt also minimizes heat generation, preventing any loss of temper, thus obviating a water quench.

Other outstanding features and advantages include a 4¼" x 12" platen that can be inverted for underside general finishing or deburring operations on small, hard-to-handle parts; removable end guard to permit inside contour finishing operations on the idler drum; a 9¾" x 16¼" table furnishing ample work support for finishing large patterns. Fully machined disc is balanced for vibration-free operation, assuring accurate finishing on close-tolerance pattern-making operations.

The belt and disc combination unit occupies a minimum of floor space and enables the operator to move from one operation to the other in seconds, as required when finishing curved, straight or irregular shaped parts.

For further information, circle Inform-A-Gram No. D2.

Longer wearing MILLIONTHS



Time you got acquainted with the world's first* and finest gage blocks. Blocks possessing correct temperature coefficient—absolute metallurgical stability. Blocks with a positive built-in wear factor—unconditionally guaranteed to be minus nothing from nominal size. Blocks, too, that feature chromium plated gaging surfaces to give you longer wearing millionths and lower gaging costs. Yes, it's time now to buy a set of

ELLSTROM CHROMIUM PLATED GAGE BLOCKS

MANUFACTURED AND CALIBRATED TO THE INTERNATIONAL INCH—EXACTLY EQUAL TO 25.4 MILLIMETERS

"W" Working Accuracy: +.000008"/−.000000"
Parallelism: .000004" / Flatness: .000004"
"I" Inspection Accuracy: +.000004"/−.000000"
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Above: Ellstrom Rectangular Set No. 92-R. Right: Ellstrom Square Set No. 81-SA, with accessories.

New Catalog contains prices and specifications—send for it today!

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*Ellstrom—*Measuring in millionths for three generations*

Hjalmar Ellstrom (1863-1942)—He gave mankind the key to mass production of interchangeable parts. For it was he alone who conceived and produced the world's first combination gage blocks—the first master reference standards accurate to the infinitesimal millionth part of an inch!

CIRCLE INFORM-A-GRAM KEY NO. 77

Roll Around Inspection

TO FACILITATE SPOT surface finish checks at Chevrolet's 6-cylinder engine plant in Flint, a Brush Surfindicator and associated gear are pushed to the areas where the tests are to be made on a specially designed wheeled dolly. It also carries a portable shelf, with special hooks that can be attached at the various stations. Tests are performed on the shelf.

One inspector performs all the spot checks with the rolling test station, and provides maintenance for the five or six Surfindicators in permanent locations throughout the plant, as well.

The permanently installed instruments are calibrated every day by the area inspectors. The maintenance checks are made twice a week. The roving inspector also checks to see that the test instruments are being used properly and trains new personnel.

When the rolling Surfindicator is not spot checking, it is located in the receiving inspection department, where finishes on vendor items are checked. end

Valve stems and tips are spot tested from each of 12 grinders.

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Listings, $12.00 per inch ($1.50 per 1/8 inch) Minimum charge, $4.50 per insertion. Rates net.

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KELLER QUICK ACTING **Drill Press Vise** ONLY **$12.50**

A rugged vise that sets up quickly to any angle. Jaws 2" deep x 4⅛" wide, open to 4¼", weight 16½ lbs.

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(JOHANSSON) and accessories. Short deliveries. Inspection and reconditioning service available at our plant.

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(for inside measurements .155 to 24 inches). Scale range plus or minus .001 graduated to .0001 and minus .020 graduated to .0001.

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(Amplifier—for outside measurements) Graduations .0001 to .000001 or .01M to .0002M.

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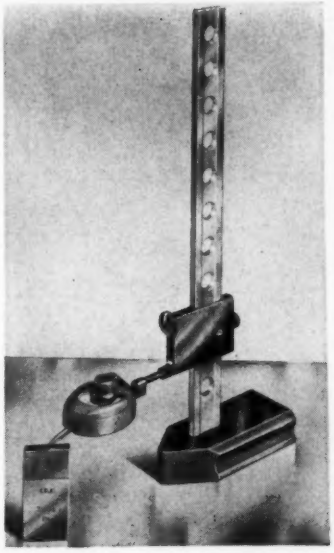

MINIKATOR
with height gage

The Minikator No. 590 is a micro-indicator especially designed for transferring dimensions and measuring in otherwise inaccessible places. The instrument is particularly suitable for indicating out-of-roundness or concentricity of grinding machine spindles and for locating drilling jigs.

The amplification device of the Minikator is based on the Mikrokator Principle, it is purely mechanical and without friction and slackness. Measuring points of two different lengths 1/16" diameter are supplied with every instrument. One point provides a measurement range of .003" (0.08 mm) with .00005" (0.001 mm) dial graduations and the other provides a range of .006" (0.16 mm) with .0001" (0.002 mm) dial graduations.

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MALLEABLE MACHINE HANDLES

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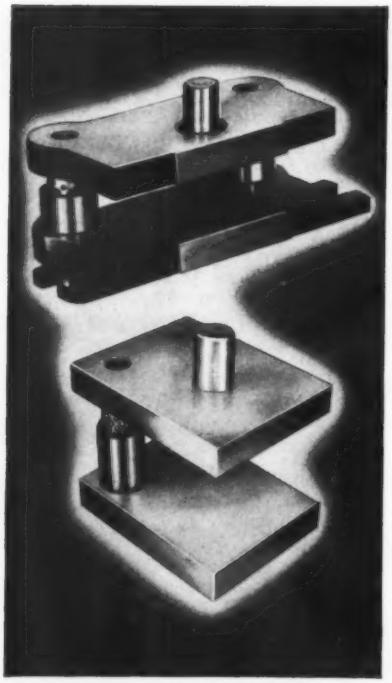
ONLY LEMPCO DIE SETS OFFER YOU "MINIMUM MAINTENANCE" OPERATION



Operating on Ball Bearing Bushings, with Aluminum Alloy Retainers, Lempco Die Sets deliver millions of strokes, retaining phenomenal precision of alignment, requiring only an occasional dab of grease for lubrication.

NO OTHER DIE SETS HAVE LEMPCO FEATURES!

Better look at those Lempco "M" and "L" style die sets, too; they're *all-steel* yet sell for the price of cast iron.

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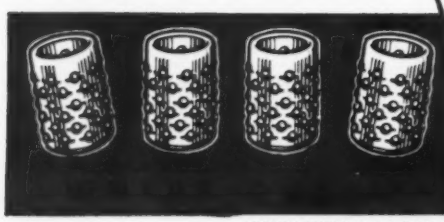

LEMPCO INDUSTRIAL, INC.
DUNHAM RD., BEDFORD, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 80

MEN YOU SHOULD KNOW

Appointment of **John E. Wilso** to the post of manager of manufacturing of the **Marchant Div'** has been announced by **Smith-Corona Marchant Inc.** He was plan manager.

National Twist Drill & Too Company has announced the elec tion of **William L. Lukens** to vic president, as well as assistant t the president.

Edward E. Kirkham, chief de velopment engineer at **Pratt & Whitney Company** since 1958, ha been named chief engineer of th machinery engineering departmen there.

John R. Bartizal has been elect ed president of the **Clearing Div'n U. S. Industries, Inc.**

Byron K. Hartman has succeed ed **Carl S. Weyandt** as president o **Syntron Company,** now that th latter has retired.

Two new vice presidential ap pointments were recently made a **The Motch & Merryweather Ma chinery Company.** They are **Alvi J. Jones,** who manages the **Ma chine Tool Manufacturing Div'n** and **D. M. Hallier,** who manages the **Cutting Tool Manufacturing** and the **Allied Products Div'ns.**

Elwood Hemlin, factory manager of **R-O Manufacturing Co.,** is now vice president of the company.

The appointment of **Alexander W. McPherson** as product development engineer has been announced by **Detroit Stamping Co.** He'll begin an expanded program to enlarge and improve their line of finished products.

David C. Verson, chairman of the board, **Verson Allsteel Press Company,** has announced the appointment of **Melvin D. Verson** to the post of president and chief operating officer.

Lawrence H. Cousineau has been elected president of **The Heald Machine Company,** succeeding **Charles F. Roby,** who recently retired.

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CIRCLE C (T-5) (ground)
High Temperature Cutting

high cobalt-tungsten super high speed steel of well-balanced composition with superior *red hardness* and *wear resistance.*

VAN CHIP (M-3) (unground, ground)
General Purpose Cutting

high carbon, high vanadium moly-tungsten high speed steel with exceptional *wear resistance* and *red hardness.*

CIRCLE T-15 (T-15) (ground)
High Abrasive Cutting

tungsten base, high carbon, high vanadium cobalt high speed steel with superior *abrasive resistance* and *red hardness.*

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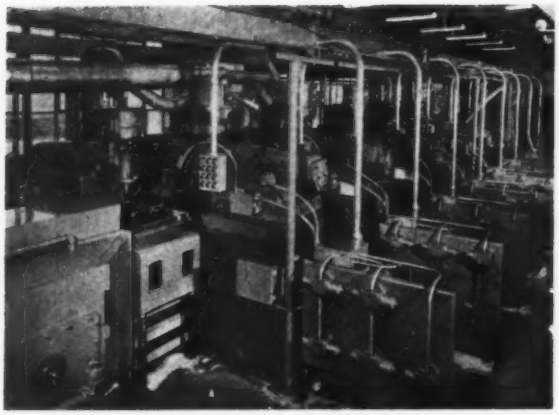


Fig. 1. This over-all view of one of the machine's two sections clearly shows the individual hydraulic systems of each station.

Fig. 2. Operator's station includes control panel lights to indicate status of each machine station. Note chip exhaust scoop.

'Building Blocks' Machine, Transfer New Rifle Part

A 32-STATION TRANSFER MACHINE has gone to work for the Winchester-Western Div'n, Olin Mathieson Chemical Corp., to produce parts for NATO's new rifle, the M-14. Building Block construction allows each station of the George Gorton Machine Co. development to perform a different operation on the weapon's receiver. The machine comes in two sections that weigh 94 tons together, yet it performs intricate operations on the forged steel receiver which weighs just 2 lb, 7 oz at the start. Tracer controlled profiling, vertical, horizontal, and angular milling, undercutting, and drilling chew off 17 ozs at a planned production rate of 45 sec/part. Station-to-station index time is 3 sec.

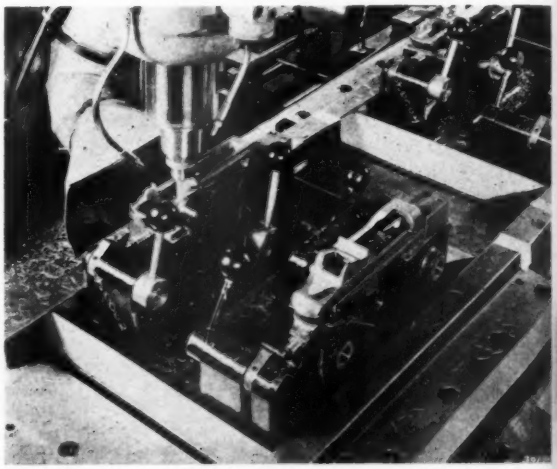


Fig. 3. Twin-fixture platen arrangement permits work to be done on far part at Sta. 9, while near part is loaded for its first pass through first eight stations.

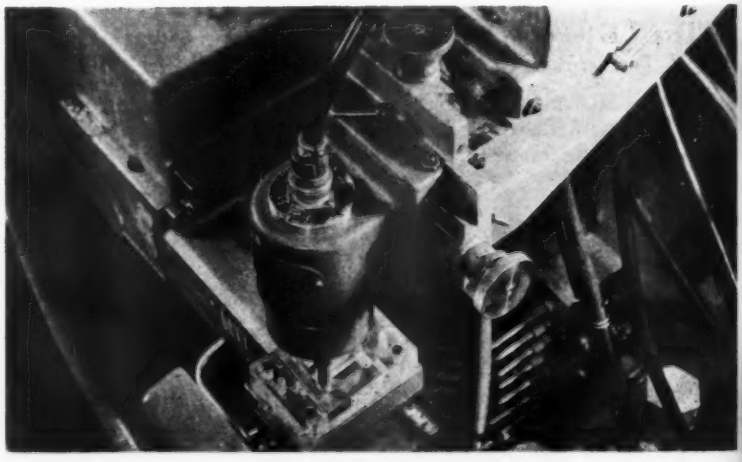
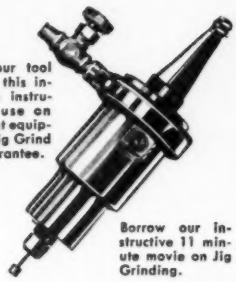


Fig. 4. A 360° tracer, mounted to the ram slide of Sta. 7, does automatic profiling. Template is fitted to non-moving slide unit.

HOLES JIG GROUND with *Vulcanaire*



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CIRCLE INFORM-A-GRAM KEY NO. 831

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USE IT EITHER WAY

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VERTICAL

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complete with cord, plug, switch ready to use **$89.95**

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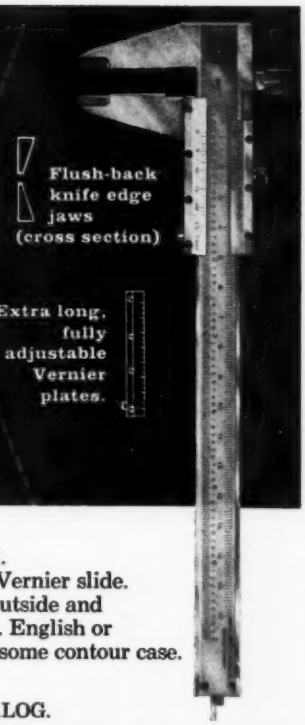
CIRCLE INFORM-A-GRAM KEY NO. 832

NEW! ETALON #17 PRECISION VERNIER CALIPER



Dull chrome plated, will not chip or peel. Exceptionally easy to read. Clear, wide Vernier slide. Hardened Stainless Steel. Read inside, outside and depth measurements from the same scale. English or English and Metric combination in handsome contour case.

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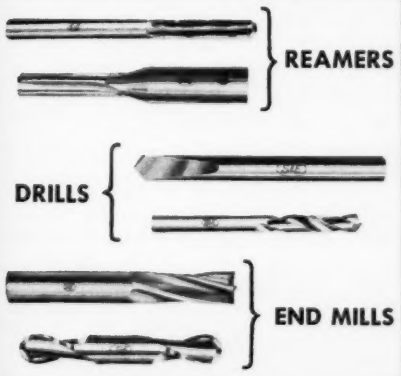
122 East Second Street, Mineola, L. I., N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 833

PRECISION CUTTING ... QUICK AND EASY with S&E SOLID CARBIDE TOOLS



S&E production cutting tools are ground from solid tungsten carbide to exact tolerances, concentric and with polished flutes.

These precision cutting tools are designed and built for one purpose: to cut fast, clean and easy; to hold size and form for extensive production runs; thus to yield lower cost tooling and higher production standards, and they do just that. Try S&E cutting tools—you will always be glad you did.

S&E are regularly fabricating special and unusual type cutting tools. Send drawings or request information—no obligation of course.

Complete catalog of S&E tools available on request.

S&E MACHINE PRODUCTS INC.
Bridgeport, Michigan
Sales offices in all principal cities.

CIRCLE INFORM-A-GRAM KEY NO. 834

New Shape-Cutting Machines Feature Unique Drive System

"ROLLER DRIVE," the patented drive principle of the new dual-carriage shape-cutting Oxweld machines, completely removes the drive wheel from the template table. A main rail carriage running on the main rails carries another pair of rails supporting the transverse carriage. With the combined motion of the two carriages, as actuated by the photocell tracer, it is possible to follow and cut metal parts and forms of any shape. Either carriage can be locked making it possible to produce perfectly straight and accurate cuts parallel to the main rails or at exactly 90° to the main rails.

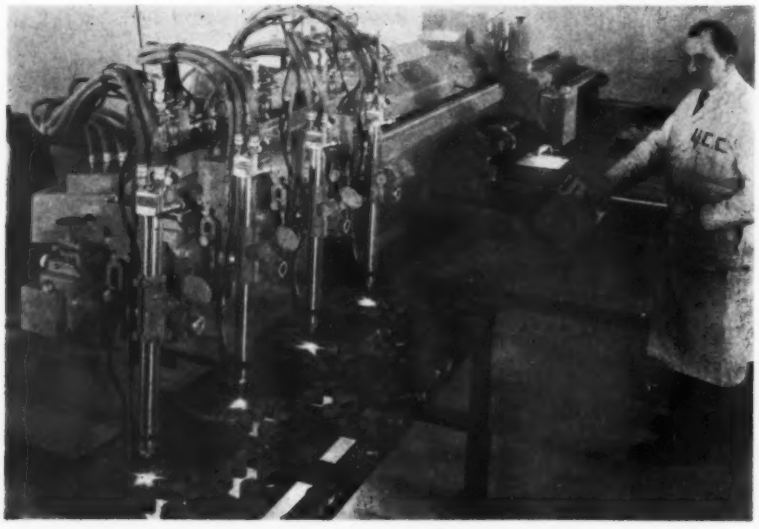
With New Tracing System

The Oxweld is equipped with a new photocell tracer with built-in kerf adjustment. Simple pencil or ink sketches of intricate metal shapes and forms are used to guide the cut. The photocell tracer accurately follows easy to prepare sketches on ordinary paper, thus eliminating the need for expensive metal or plastic templates, photographic negatives or complicated and costly silhouettes. Wear on templates and cover sheets is completely eliminated since neither the machine nor tracer ever comes in contact with the drawing or tracing surface.

Tracing accuracy is exceptional, to ±0.005". Ordinary light, sunlight or shadows do not interfere with the precision operation of the tracer. The tracer can negotiate 90° turns with 1/16" radius at speeds up to 16 ipm and 90° turns with 1/8" radius at speeds up to 27 ipm. The Oxweld may be located indoors or outdoors without regard for lighting conditions. An operator can use as much light as he needs to follow the cutting operation without fear of upsetting the cutting pattern. He can steer manually or use remote control buttons to engage the template.

The kerf adjustment represents a radical improvement over existing types of tracing systems. Parts can be reproduced from an exact size drawing without the necessity of making allowance on the drawing for kerf width (metal removed by the cutting oxygen jet). Drawings of parts are made or traced in the exact size of the part desired. The kerf compensator dial is then set for the plate thickness being cut and compensates for kerfs up to 1/4" wide so that reproduced parts are exactly the same size as the line drawing.

Fig. 1. The combined motion of the Oxweld's two carriages makes it possible to follow and cut metal parts and forms of any shape.



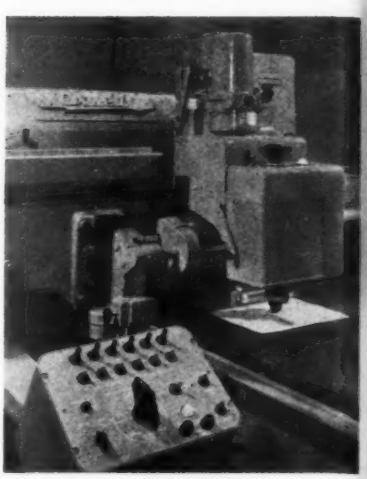


Fig. 2. The Oxweld is equipped with a newly developed tracing system. The photocell tracer (on the right) is being guided by a simple exact size pencil sketch on ordinary paper of the intricate shape being reproduced in Fig. 1.

Automatic Valving

Preheat gases and cutting oxygen are controlled by solenoid valves large enough to assure an adequate gas supply for multi-torch operations. Each torch has an individual cutting oxygen solenoid valve to assure instantaneous shut-off of gas eliminating overrun at the end of a cut. Valves are controlled by electric switches on the control panel. In addition each torch has individual valves for fine adjustment of the preheat gases and a shut-off valve for the cutting oxygen.

Motorized Torch Holders

Motorized torch holders provide automatic up and down adjustment of all torches. A new automatic height adjustment control is also available. This unit rides the plate in front of the torches and quickly senses the slightest deviation in levelness of the plate surface. The motorized torch holders react instantly, lowering or raising the torches to compensate for any deviation.

For additional information, circle Inform-A-Gram No. D3.

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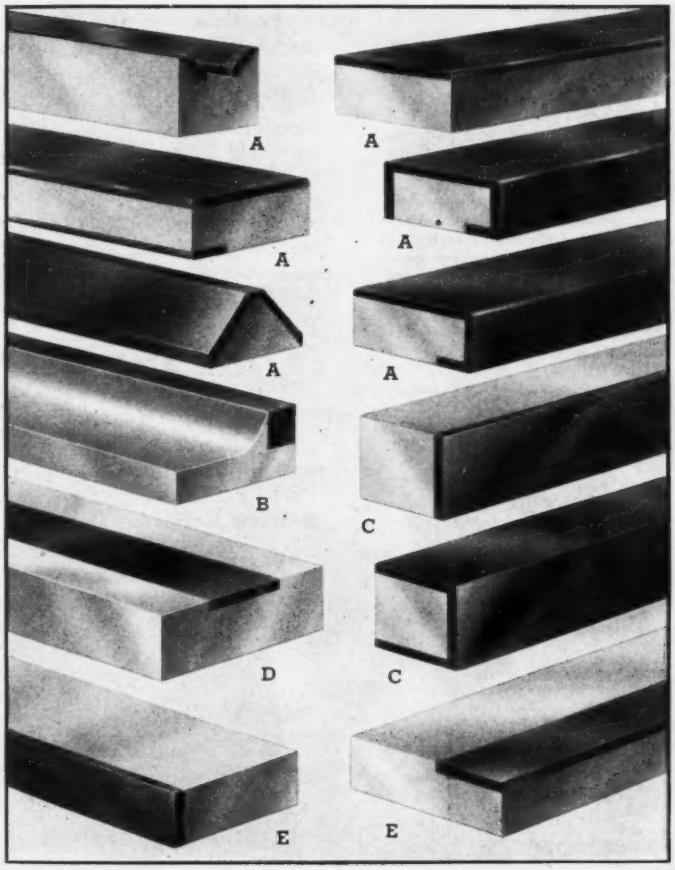

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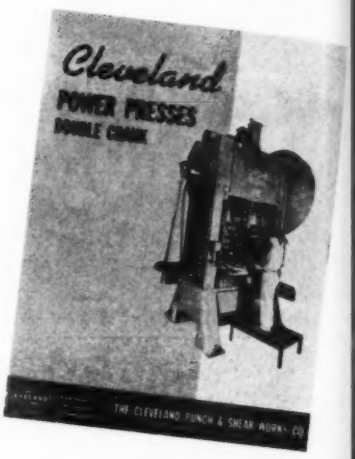
Catalogs and other helpful literature

New Cap Screw bulletin gives specification on the new 1960 Cap Screw series from Set Screw & Mfg. Co. It includes a comparison of both old and new series and data on when the change will be made to the new series. For a copy, circle Inform-A-Gram No. C1.

An Economical Hydraulic packing material, compounded of a plastic and an elastomer, is resistant to abrasion and can be used in acid and alkaline applications. Get data on REX-SYN from E. F. Houghton & Co., or circle Inform-A-Gram No. C2.

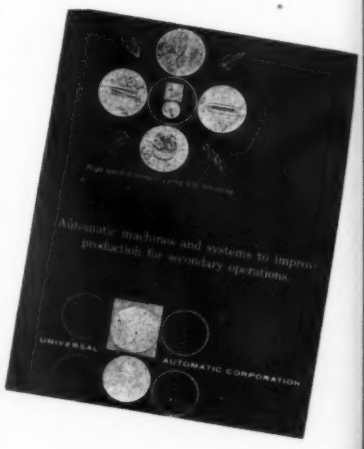


Straight - Sided Double - Crank mechanical power presses in The Cleveland Punch & Shear Works Co.'s line are detailed in new catalog SD2-60. These presses feature welded steel construction and new streamlined design. For a copy of the catalog, Circle No. C3.

"Products for the Plant" describes air compressors, air hoists, air and electric tools, and other Ingersoll-Rand products. Get a copy of 8-page Form 223 from I-R, or circle Inform-A-Gram No. C4.

Universal Ball Joint adjustable-spindle tapping and drilling heads in the new Knuckle-head line are described in new Bulletin 600 C from Ettco Tool & Machine Co. For a copy, circle Inform-A-Gram No. C5.

Automatic High Speed drilling, tapping, and threading machines and systems are described in a bulletin from Universal-Automatic Corp. For a copy, Circle Inform-A-Gram No. C6.



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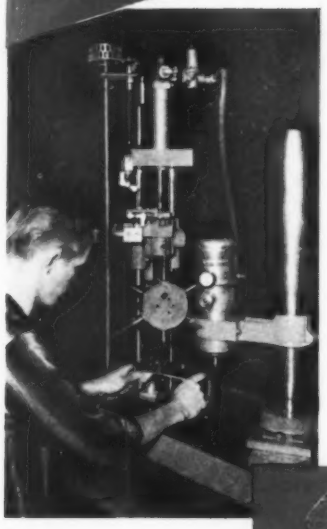

Hoffman Electronics, Los Angeles, California, have increased the rate of drilling operations on Gear Box End Plates from 12 to 19 parts per hour on a Burgmaster Bench Model 6-Spindle Turret Drill, an increase of 58%. Formerly drilled on a line of four Single Spindle Drills, each lot of 5000 parts required the operator to walk over 10 miles while shuttling the jig back and forth.

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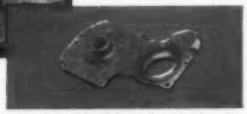

The turret action of the Burgmaster Machine lends itself to time saving tooling arrangements like this. Up to six separate tools can be rapidly and accurately presented to the work at one station to perform such operations as drilling, reaming, tapping, etc. For fastest investment return, savings in floor space, faster production and reduced operator fatigue, investigate the many advantages of Burgmaster Drilling Machines for reducing production costs.

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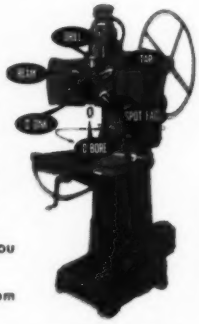

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C1	C12	C23	P4	P15	P26	P37	P48
C2	C13	C24	P5	P16	P27	P38	P49
C3	C14	C25	P6	P17	P28	P39	P50
C4	C15	C26	P7	P18	P29	P40	P51
C5	C16	C27	P8	P19	P30	P41	P52
C6	C17	D1	P9	P20	P31	P42	P53
C7	C18	D2	P10	P21	P32	P43	P54
C8	C19	D3	P11	P22	P33	P44	P55
C9	C20	P1	P12	P23	P34	P45	P56
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High-Precision Radial ball bearings, type HDR, with load capacities from 19% to 55% greater than equivalent size Conrad bearings, are described in Catalog 60 from Split Ballbearing, a Div'n of MPB, Inc. Circle Inform-A-Gram No. C7.

An Automatic Recessing tool that cuts recesses to exact depth, width, and position in one operation in 3-7 sec is described in a new bulletin from Madison Industries, Inc. For a copy, Circle No. C8.

The Full Line of heat treating furnaces manufactured by Sunbeam Equipment Corp. is described in their latest bulletin. For a copy, circle Inform-A-Gram No. C9.

Preformed Tumbling Media is both title and subject of a new bulletin from Fortune Industries, Inc. Circle No. C10 for a copy.

The Value of Cut Machining, in which both cut ends of rods, angles, channels, and solid bar stock are cut clean with circular abrasive saws, is the topic in the latest catalog from Wallace Supplies Mfg. Co. Circle No. C11.

Small Tools — vises, clamps, punch holders, die set pullers, collet holding fixtures, etc. — available from Durant Tool Supply Co. are listed in their new "Small Tool Catalog." Circle No. C12.

The Photo-Mechanical Duplicating process for producing thin sheet metal stampings with minimum die cost is explained in literature from Dayton Rogers Manufacturing Co. Circle No. C13.

Toroidal Coil Winding, as performed by Universal Manufacturing Co., Inc.'s Model TVW winding machine, is described in a bulletin. For a copy, circle No. C14.

Explosive Forming via the Explosiform process is described in new Technical Bulletin No. 4 from Propellex Chemical Div'n, Chromalloy Corp. For a copy, circle Inform-A-Gram No. C15.

88-Pages of Air cylinders, valves, clamps, and dial feed tables make up Allenair Corp.'s new catalog. For a copy, circle No. C16.

Resistance Welding tips, tip holders, and alloys in the Tuffaloy line are described in a new 24-page catalog from Air Reduction Sales Corp. The new "RW" taper numbering system, proposed by the Resistance Welding Alloy Assoc., is used in it. Circle No. C17.

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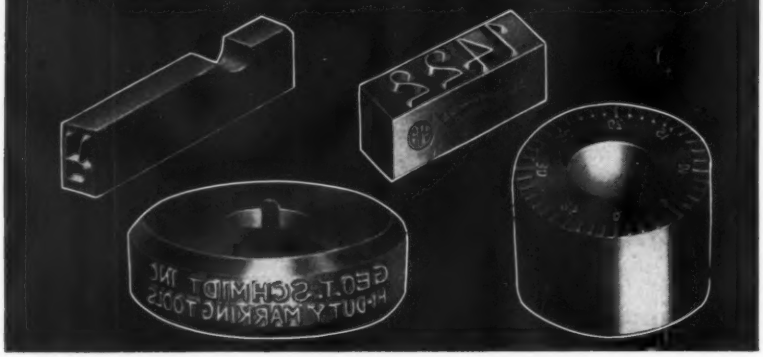

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Catalogs . .

A New Micrometer Hole Gage, which provides a practical method for accurately measuring bore and hole sizes and permits taking measurements at the bottom of holes, is subject of a bulletin from The Lufkin Rule Co. Circle Inform-A-Gram No. C18.

Tools for Automatic Screw machines and turret lathes in the Tru-Grip line are described in literature from Dimension Products. For a copy, Circle No. C19.

Faster Speeds, bigger feeds, longer tool life, less downtime, and more job comfort — resulting from proper cutting fluid selection

— are discussed in a new technical brochure (No. 460B) from Master Chemical Corp. For a copy of this handbook on chemical coolants, Circle Inform-A-Gram No. C20.

Drill Deep Holes accurately on turret lathes with the new Boyar-Schultz deep hole drilling attachment, subject of a new data sheet. For a copy, Circle Inform-A-Gram No. C21.

A Useful Die Cast zinc alloy decimal equivalent card, 3⅜" x 1⅞", is available from The Newton-New Haven Co. Get one by circling No. C22.

A Unique Reference Chart for printed circuit draftsmen shows pre-cut shapes and sizes of pressure sensitive drafting aids required to make paste-up printed circuit drawings. Get a copy from By-Buk Co., or circle No. C23.

"Noise Reduction and Bar Stock Protection with Byers PVC Stock Tubes" tells how to reduce machine shop noise 83-88% and eliminate bar stock damage in screw machines. Get a copy from A. M. Byers Co., or circle Inform-A-Gram No. C24.

"The Stainless Steels" is Vanadium Corp. of America's latest addition to the literature covering the history of this metal. For a copy, circle No. C25.

Optical Comparators — what they are and do, are covered in a handy new reference bulletin from Jones & Lamson Machine Co. Get a copy by circling No. C26.

A Chart showing comparative specifications, analyses, and minimum physical properties of Shenango nonferrous alloys is in Bulletin No. 157 from Centrifugally Cast Products Div'n of The Shenango Furnace Co. For a copy, circle Inform-A-Gram No. C27.

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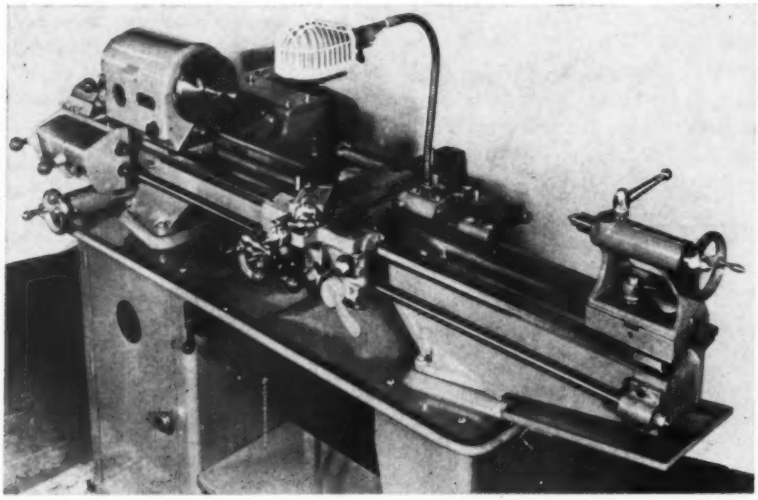
ROCKFORD, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 89

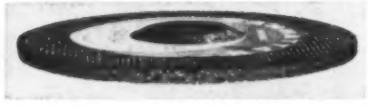
Product News



'Long Bed' 10" Lathe

The new "long bed" model Delta 10" metal cutting lathe, with a 36" capacity between centers, is from Rockwell Manufacturing Co.'s Delta Power Tool Div'n. It features variable speed drive, a choice of 54 feeds or thread pitches, 3/4" collet capacity, and other features of their standard 10" metal lathe. For details, contact the company, or Circle Inform-A-Gram No. P1.

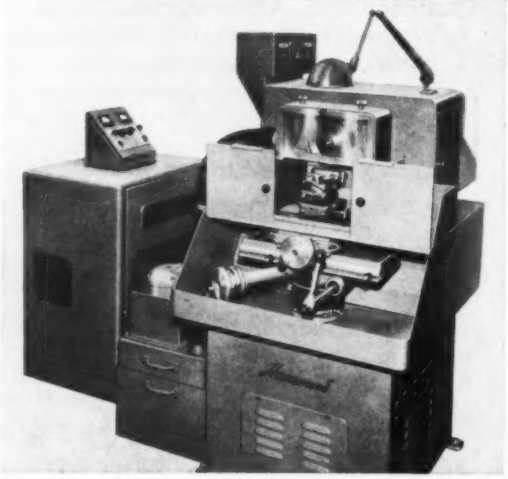
Fast Cutting Disc



Longer life and increased metal removal are benefits that go to the users of the new Fast-Cut moldisc. The depressed-center abrasive discs are available in 7" and 9" dias and 1/8", 3/16", and 1/4" thicknesses. For more data, write Abrasive Wheel Dep't, Manhattan Rubber Div'n, Raybestos-Manhattan, Inc., Passaic, N. J., or Circle Inform-A-Gram No. P2.

Low Cost & Electrolytic

This new, low-cost electrolytic grinder from Hammond Machinery Builders, Inc., 1631 Douglas Ave., Kalamazoo, Mich., has oscillating cup wheel grinding on one end, chipbreaker grinding at the other. It's ideal for low and medium grinding, and is equipped with an Anocut power pack. Get Bulletin 248-T. Circle No. P3.



Insert Valves

These new Humphrey cartridge type insert valves eliminate the complicated maze of "plumbing" usually required when a number of valves are installed close together. As many as 15 cartridge valves can be combined into a single module a few inches square, fed by a single supply line and with a common exhaust. Write Humphrey Products Div'n, General Gas Light Co., Kalamazoo, Mich., or Circle Inform-A-Gram No. P4.

Safe Drum Handling

Standard 30 and 50 gal metal drums can be accommodated on the new model of the Economy drum truck. It features beveled loading toes, a spring-controlled chime-hook, and a curved handle for faster, safer drum handling. For details, write Economy Engineering Co., 4501 W. Lake St., Chicago, Ill., or Circle No. P5.

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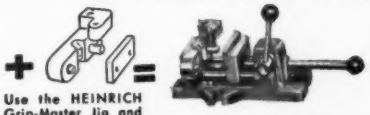

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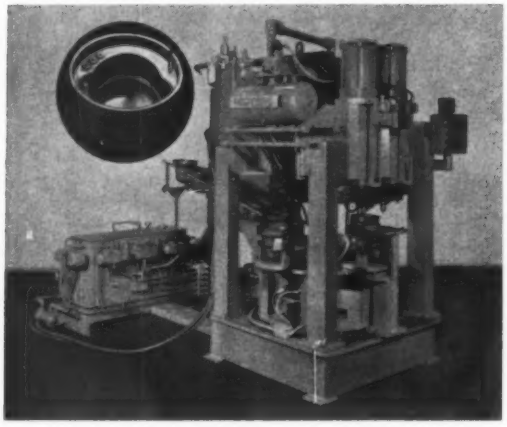
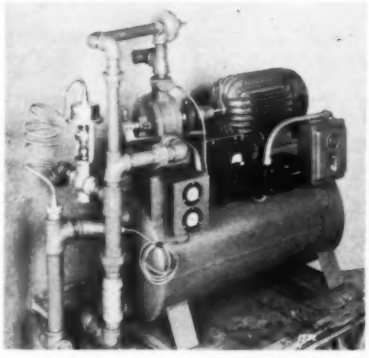
Product News

Stud Welding Unit



Costs are cut with a special automatic high speed stud welding machine which allows simple screw machine products to be used as studs. The 4-station index welding machine is used instead of arc welding and eliminates the need for farrelled studs and for stud-flanging operations. Get details from Progressive Welder & Machine Co., 915 Oakland Ave., Pontiac, Mich., or Circle Inform-A-Gram No. P7.

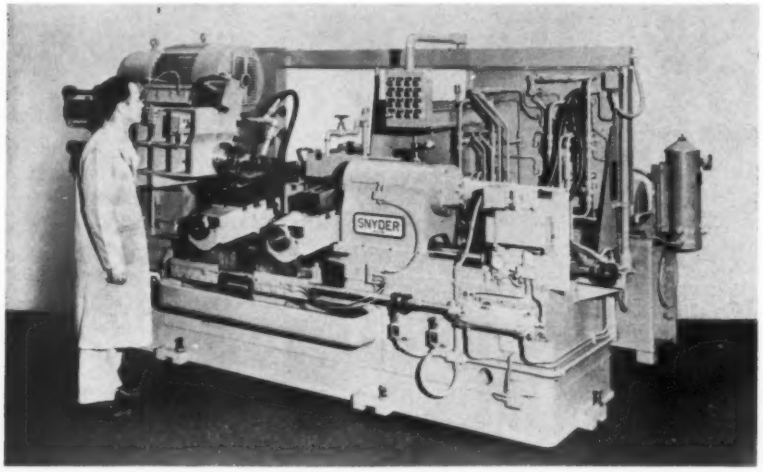
Water Saver



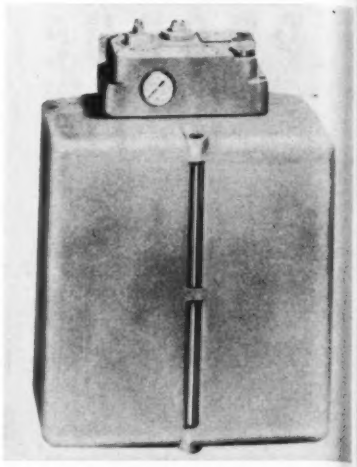
Water savings of 50% and more are possible with this Ther-Monic Economizer, which features an electro-magnetic device for preventing scale and corrosion. The self-contained recirculating system can be used with all types of induction heating equipment. Write Dep't 9, Induction Heating Corp., 189 Wythe Ave., Brooklyn, N. Y., or Circle Inform-A-Gram No. P6.

Automatic Lathe

The new Snyder special heavy duty automatic lathe rough turns and faces eight different forged steel automotive axle shafts at a rate of 105 pcs/hr. It has an overhead slide, a rear slide, and two pivot-mounted turning slides. For details, write the Snyder Corp., 34000 E. Lafayette, Detroit 7, Mich. or Circle Inform-A-Gram No. P8.



Mist Coolant Unit



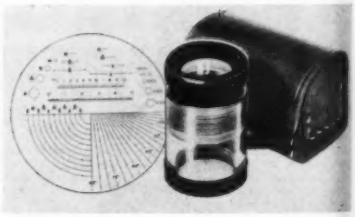
A self-contained mist coolant unit with 5 gal reservoir eliminates the usual tangle of tubes, valves, and awkward supply tanks. The Spraymist includes an air filter, trap, regulator, and gage; solenoid valve and conduit box; pressurized coolant reservoir; and filter. Write the Bijur Lubricating Corp., 151 W. Passaic St., Rochelle Park, N.J., or Circle Inform-A-Gram No. P9.

Removable Ink

Temporary markings made with Water Off Ink are easily removed by rinsing with water. It adheres to plastics and metals and can be applied by rubber stamps and ordinary ink pads or by felt-tipped pens. Many colors are available. Write Organic Products Co., P. O. Box 428, Irving, Texas, or Circle Inform-A-Gram No. P10.

On-The-Spot Checker

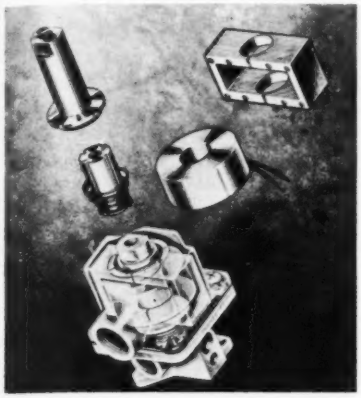
Suited to a wide range of checking, measuring, and analyzing jobs, this low-cost but accurate pocket comparator is available from Edmund Scientific Co., Barrington, N. J. Full 6X magnification and etched glass reticle make it possible to check linear dimensions, radii, and angles, as well as surfaces. For details, Circle No. P11.



Product News

3-Directional Control

A new, large capacity 3-way directional control valve has been added to the A Series of solenoid valves made by The Skinner Electric Valve Div'n, Dept. DCA-209, New Britain, Conn. Available in 3/32", 1/8", and 5/32" orifice sizes, it's compact, lightweight and can mount in any position directly to the line and operate on pressure differentials up to 250 psi. Circle No. P12.



Key Island

This compact, sturdy metal workbench stand holds 16 Allen hex keys — all but the very large ones. All keys are made from alloy steel, heat treated for strength and toughness. Get details from Allen Manufacturing Co., Hartford, Conn.

Brazing Alloys

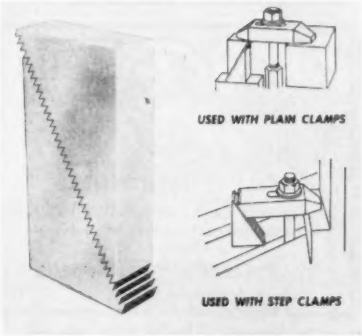
A new series of high strength, high temperature brazing alloys for joining stainless steel and superalloys can bridge joint gaps up to 1/16". Write Metallurgical Products Dept., General Electric Co., Detroit 32, Mich., or Circle Inform-A-Gram No. P13.

'Mini' Multiple Drill

This multiple drill head provides speeds high enough for very small drills on center distances as small as 3/8". Especially for precision production of miniaturized parts, it features speed ranges of 0-8000 rpm. Maximum distance between centers is 3". For details write Metron Instrument Co., 432 Lincoln, Denver 3, or Circle No. P15.

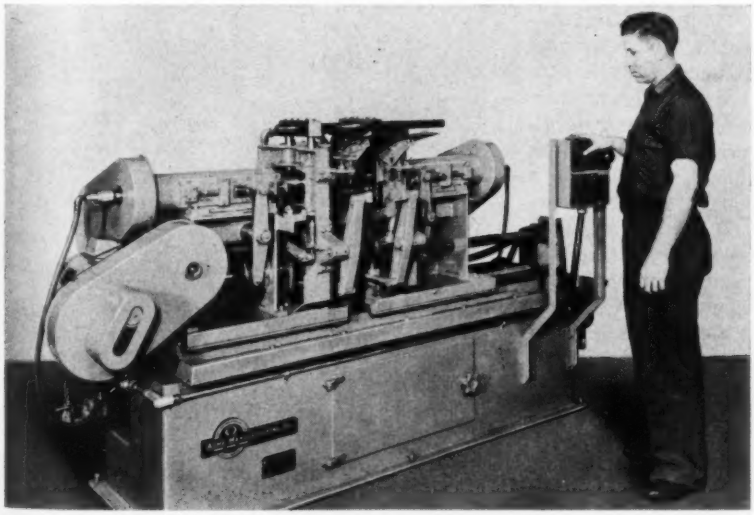
Aluminum Step Blocks

New aluminum step blocks can be used with plain or step clamps and are interchangeable with all sizes of steel step blocks. They're lightweight, high in tensile strength, and won't mar or scratch. Nine sizes are available. Get details from Northwestern Tools, Inc., 116 Hollier Ave., Dayton 3, Ohio, or Circle Inform-A-Gram No. P16.



Deburring Machine

The new Acme double-end deburring machine automatically deburrs tubular steel parts of various diameters and lengths. Tubing 3/4" to 2 1/4" dia and 2 1/2" to 24" long can be deburred at production rates up to 6000 pcs/hr. Write the Acme Mfg. Co., 1400 E. 9-Mile Rd., Detroit 20, Mich., or Circle Inform-A-Gram No. P14.



New Coolant Pump

Newest in the "Gusher" line of coolant pumps is the seal-less Model 9-P3, a flange-mounted type with one internal and two external discharges. It's primarily for machinery with comparatively shallow reservoirs. For details, write Ruthman Machinery Co., 1800 Reading Rd., Cincinnati 2, O., or Circle No. P17.

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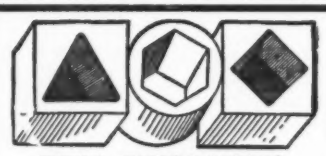
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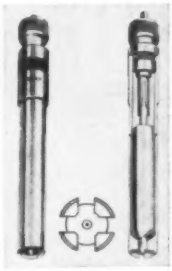
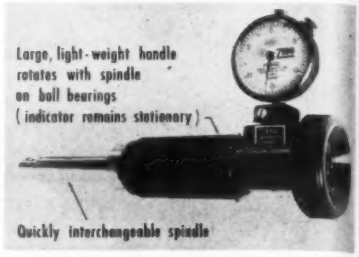
Product News

Expanding Transfer Punches



Through the expanding feature, a set of three Kelly Tru-Center transfer punches have a size diameter range from 1/4" to 11/16". Accuracies to 0.001 inch are possible with them. Get catalog sheet from Kelly Tool & Mfg. Co., 3408 Monterey Rd., Los Angeles 32, or Circle No. P18.

Hole Location Gage


Large, light-weight handle rotates with spindle on ball bearings (indicator remains stationary)
Quickly interchangeable spindle

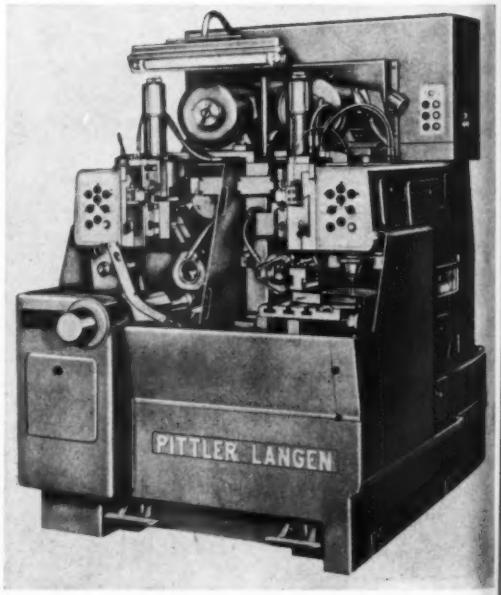
This patented hole location gage features a quickly interchangeable spindle for lasting economy. It's used to check hole location, concentricity, and alignment, or to explore holes for taper, out-of-round, or out-of-square. For literature and full-size template, write to Zero Internal Gage Co., 11360 Schaefer Hwy., Detroit 27, Mich., or Circle No. P21.

Air Marker

The new air-powered Airiter will mark on practically all materials. The reciprocating air motor goes to 12,000 blows/min with a 1 cfm air consumption at 90 psi. Speed of blow and depth of mark are infinitely variable and controlled by turning the tool's throttle. Get details from Rotor Tool Co., 26300 Lakeland Blvd., Cleveland 32, Ohio or Circle Inform-A-Gram No. P19.

New Automatic Chucker

The new Pittler "Pidofat" is an automatic two - spindle chucking machine for economical production or short run operations. The left hand spindle has a turret slide for boring and a compound slide for cutting; the right hand spindle, a heavy - duty cross slide for turning and a compound slide for cutting or copying. Contact Cosa Corp., 405 Lexington Ave., New York 17, N. Y., or Circle Inform-A-Gram No. P20.



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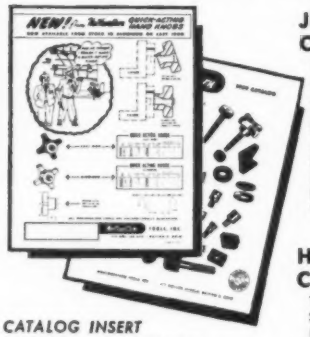

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Drills, taps metal, wood, plastics. 2-minute setup on most drill presses; quick, accurate adjustment. Variety of models, 1/2" to 12-5/" centers. . The drill spindles are held rigidly in position when two nuts are tightened. Sturdily constructed. Suitable for adaptation to large or small drill presses. Models A and B made with sleeve. Models C and D with over-arm adaptation, equipped with guide pins, springs and brackets, mounted to a cast-iron base with surfaces ground for use of drill fixtures. All models can be used for drill or tapping on tapping machine or drill press with reversible spindle. Also used with standard tapping heads. Multiple heads with fixed center distances are designed and built to meet your requirements. Available with GM Sleeves, Morse taper or drill chucks. Write for full information.

LINDERME ENGINEERING & SALES
8132 PURITAN • DETROIT 38, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 964

It pays to have gage blocks inspected by ELLSTROM Metrology Laboratory

Costs so little, saves so much! | *Write for complete information today!*

ELLSTROM STANDARDS DIVISION • DEARBORN GAGE CO.
22038 BEECH STREET • DEARBORN, MICHIGAN
Measuring in Millionths for Three Generations

CIRCLE INFORM-A-GRAM KEY NO. 965

LEAD HAMMERS—Buy Cook "SHUR-GRIP"

They're a MUST in every shop where many blows have to be struck without marring surfaces. Available with "SHUR-GRIP" drop forged handles.

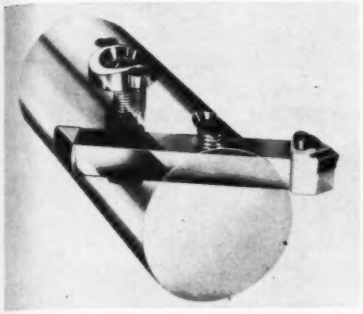
Write for circular and prices

COOK'S LEAD HAMMER SERVICE
68 Massasoit Ave., E. Providence 14, R. I.

CIRCLE INFORM-A-GRAM KEY NO. 966

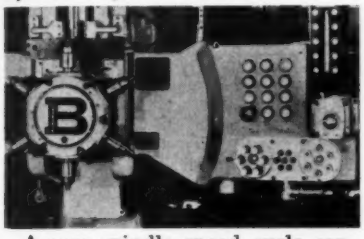
Product News

T-A Boring Inserts



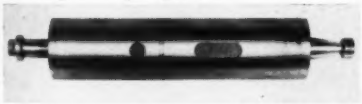
This phantom drawing shows the new Davis throw-away carbide insert cutter mounted in the Super-Mike micrometer adjustable flycutter bar. It can be set in 0.0001" increments by means of a direct-reading micrometer dial screw. For details, write Davis Div'n, Giddings & Lewis Machine Tool Co., Fond du Lac, Wisc., or Circle Inform-A-Gram No. P22.

Spindle Speed Selector



A new spindle speed-cycle control selects any one of eight speeds for each spindle on Burgmaster automatic turret drills. Selection is simply made by turning a knurled knob, corresponding to each turret spindle, to the most efficient machining speed. For details, write Burg Tool Mfg. Co., 15001 S. Figueroa St., Gardena, Calif., or Circle Inform-A-Gram No. P23.

Heavy-Duty Spindle



This new, heavy-duty tapered roller bearing spindle, Model BD4-2, has been introduced by the DoAll Co., Des Plaines, Ill. Belt-driven, it's rated up to 2700 rpm and is recommended for crush grinding, roll grinding, and vertical spindle grinding. Contact the company, or Circle No. P24.

In an exclusive process, Porter Precision Products WELDS Tungsten Carbide to tool steel. These punches are made to approved ASTE Standards. PORTER GUARANTEES THE STRENGTH OF THE WELD TO EQUAL THE STRENGTH OF CARBIDE ITSELF. The carbide will not come off.
3P Carbide Tipped Punches give longer wear life; can be used in your present steel dies. Available from stock—immediate delivery. Write for 3P Catalogue No. 200.

Porter Precision Products
P.O. BOX 208
CINCINNATI 15, OHIO

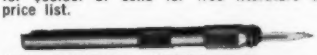
CIRCLE INFORM-A-GRAM KEY NO. 971

POLISH PLASTIC MOLDS
. . . lap carbide, steel, tools WITH LOW COST TETRABOR

- Tetrabor is an oil paste of boron carbide.
- CUT LAPPING COSTS— Tetrabor costs much less than diamond. Gives superior finish.
- INCREASE PRODUCTION — Faster acting Tetrabor permits its use in place of conventional compounds at no increase in cost.
- Available in 100 gram tube in a range of grits.

Dealer Inquiries Invited

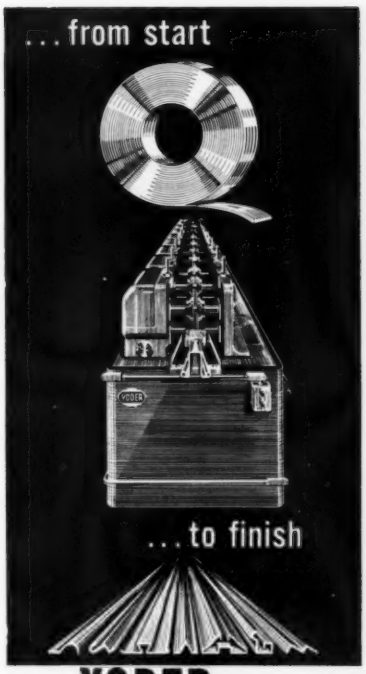
Order trial kit containing 5 grams of 12 grits for $15.50. Or send for free literature and price list.



NEW ADJUSTABLE BURRING TOOL . . . a handy vest pocket scraper and burring tool. Blades are fully retractable, replaceable and can be reversed. Made from hi-speed tool steel. Ideal for burring in light metal operations length 4-1/2". Complete $2.54 ea. Min. order 6 —Blades $12.50 doz.

TITAN TOOL SUPPLY CO.
Box L, 1419 Hertel Ave., Buffalo 16, New York

CIRCLE INFORM-A-GRAM KEY NO. 972



YODER ROLL-FORMING EQUIPMENT

Profits are available to you through the production of many shapes in metal . . . made with precision and economy on Yoder Cold Roll Forming Equipment.

Produce tubular, ornamental or structural shapes from a variety of metals in widths from a fraction of an inch up to 80 inches or more, and in stock up to ¾" thick. Your investment is comparatively modest, and with proven low operating costs, will give you one of the most profitable operations in your plant.

Experienced Yoder engineers will, without obligation, study your annual metal forming requirements. Many times they can point out that the installation of roll forming equipment would—even if operated only intermittently—soon justify its initial cost.

Send today for this comprehensive, 88-page illustrated text. It fully describes Cold Roll Forming Equipment, processes and products.

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ENGINEERING YODER MANUFACTURING
COLD ROLL FORMING MACHINES

CIRCLE INFORM-A-GRAM KEY NO. 973

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NEW CATALOG!

• Tells how to select Ideal Gold Band Live Centers to fill your needs exactly. Over 40 different sizes and styles in 4 models—**Universal, Pipe Point, Multi-Duty, Heavy-Duty**—custom quality performance at production prices.

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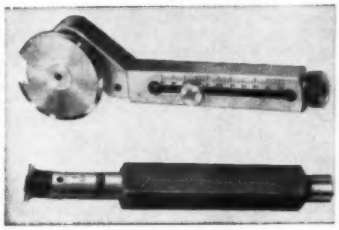
CIRCLE INFORM-A-GRAM KEY NO. 981

THREAD Cutting Tool



Provided with a scale for angular setting.

Circular Cutter, in high speed or carbide, has a negative profile and machines both thread flanks simultaneously. Thread cutting discs for all threads are available for both external and internal tool holders.

ACME TOOL CORP.
71 West Broadway,
New York 7, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 982

DO YOU HAVE UNSOLVED TESTING PROBLEMS ?????

They can be solved. We design and build special testing machines to fit the most peculiar requirements.

Tell us about yours.

DETROIT TESTING MACHINE COMPANY

9386 Grinnell Avenue, Detroit 13, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 983

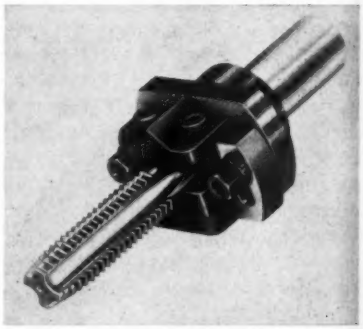
Product News

Plastic Pattern Planks

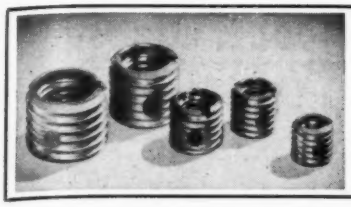
Ordinary woodworking tools can shape Ren Wood plastic planking into master models and patterns. It has the necessary physical and mechanical properties, holds dimensions accurately, and eliminates the knotholes and warping found in mahogany and impregnated wood planking materials. Standard lumber sizes are available. For details, write Ren Plastics, Inc., Dept. RP-59, 5422 S. Cedar Rd., Lansing 9, Mich., or Circle Inform-A-Gram No. P25.

V-Jaw Tap Holder

Faster setups, reduced tool inventory, and elimination of bushings are benefits for users of a new V-jaw tap holder. A wide range of extended or close-held taps can be slipped in to the adjustable V-jaw and pressure-locked for uniform seating. Ask for Data Sheet No. BNRTH DS-260 from Brookfield, Inc., Stoughton, Mass., or Circle Inform-A-Gram No. P26.



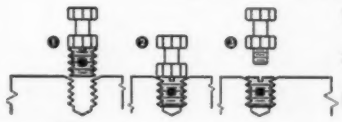
U. S. SAVINGS BONDS ARE AVAILABLE. SEE YOUR PAYMASTER FOR DETAILS.



E-Z-LOK INSERTS

- Self-locking, threaded inserts.
- Vibration-resistant with patented NYLOK feature.
- Simple to remove and re-use.
- Use in aluminum, magnesium, plastic or cast-iron.

EASY 1-2-3 INSTALLATION



1. Drill, countersink (90° to 100°).
2. Tap National coarse thread.
3. Install with bolt or screwdriver.

Distributors Wanted TOOL COMPONENTS, INC. Box 1036, Gardena, California

CIRCLE INFORM-A-GRAM KEY NO. 991

Rust-Lick 606

Moisture-Absorbing Rust-Preventive Mist

for tools • dies • jigs • gages • molds • metal parts • machinery • fixtures • raw stock or work in process • during indoor shipment or storage

Available in 12 oz. aerosol cans; 2, 5, 30, 55 gallon drums with fog maker. One trigger handle free with each carton of 12 oz. spray cans. Handle converts spray can to spray gun. Write for free sample.

RUST-LICK, INCORPORATED 755 BOYLSTON STREET BOSTON 16, MASS.

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LASSY TAPPERS . . .

Lassy Tappers make tapping easy, fast and simple. Exclusive patented features eliminate guess work, drastically reduce labor costs, save taps.

3 SIZES.

FREE ILLUSTRATED CATALOG AND PRICES.

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LASSY TOOL CO.
PLAINVILLE, CONN.

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GENESEE Carbide Tipped Inserted Blade Facing and Counterboring Tools

Interchangeable Pilots

Constant Chip Space Throughout Life of Blades

Standard Sizes 1¼ to 4 Standard with Straight or Morse Taper Shanks

Carbide Tipped H.S.S. Blades. Save 25% or more over cost of Solid Tools

• Consult our Engineering Dept. on your Inserted Blade Production Tool Problems.

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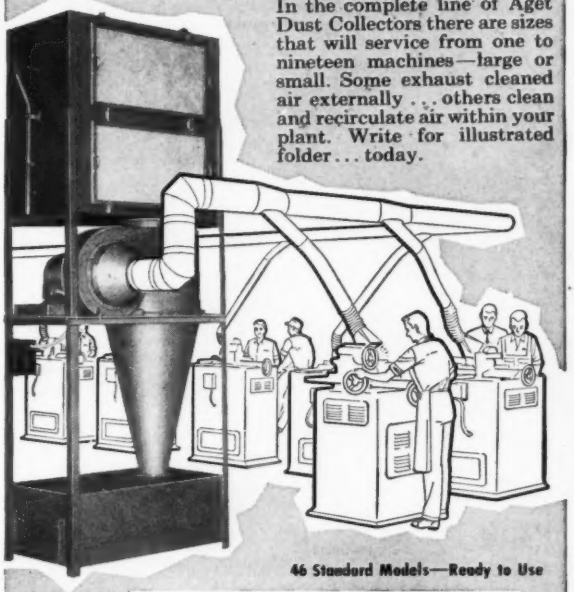
566 HOLLENBECK STREET, ROCHESTER 21, N. Y.
Adjustable Hollow Mills • Facing and Counterboring Tools • Tube Deburring Tools • Special Production Tools • Since 1908

CIRCLE INFORM-A-GRAM KEY NO. 994

just ONE heavy duty unit services up to 19 MACHINES

DUSTKOP STOPS DUST

In the complete line of Aget Dust Collectors there are sizes that will service from one to nineteen machines—large or small. Some exhaust cleaned air externally . . . others clean and recirculate air within your plant. Write for illustrated folder . . . today.



46 Standard Models—Ready to Use

AGET manufacturing company
1394 Church Street • Adrian, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 995

You Need an Extra Hand Now to Speed Up Production!

HEIMANN TRANSFER SCREW SETS

IN 11 SIZES No. 6 to 1" N.C. In all S. A. E. sizes.

Here is the *faster*, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench —no other tools needed. Get more work now—save money too!

HEIMANN MFG., CO. • URBANA, OHIO

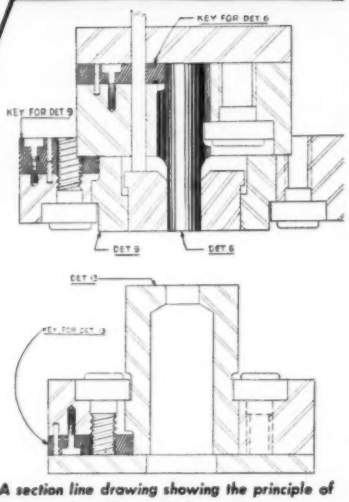
CIRCLE INFORM-A-GRAM KEY NO. 996

NEW
HOVIS KEY-ALIGNED DIE
THE LATEST ADDITION TO OUR STANDARD UNITS

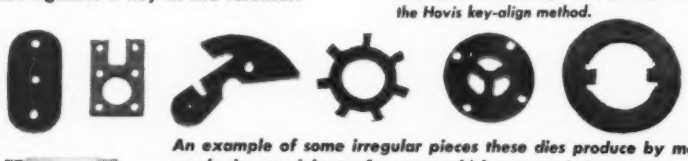
a must for irregular stampings

ELIMINATES ALL SET-UP ERRORS AND INSURES UNINTERRUPTED ACCURACY

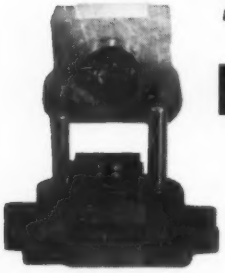
When producing irregular shaped stampings, it is important that the cutting members of the die are located in the proper radial alignment. Hovis has introduced the key-aligned die to meet this requirement . . . With the key-aligned die any press operator can install the inserts without the possibility of misalignment. This is accomplished with a flat on the insert which locates against a key in the retainer.



A section line drawing showing the principle of the Hovis key-align method.



An example of some irregular pieces these dies produce by merely purchasing special sets of parts on which we are glad to quote



Made in 6 sizes:
¾"-1½"-2½"-4"-6"-8"

▲▲▲▲

HOVIS UNIVERSAL COMPOUND DIES

for producing WASHERS and SMALL STAMPINGS . . . No need to make a NEW DIE for every STAMPED PART

By simply removing and replacing five, small, interchangeable inserts a new part may be produced . . . This method makes possible all production including irregularly shaped pieces and shallow draws.

HOVIS SCREWLOCK COMPANY
8100 E. NINE MILE ROAD • BOX 97 • WARREN, MICHIGAN
Phone: Slocum 7-4800 Suburb of Detroit

CIRCLE INFORM-A-GRAM KEY NO. 1001

DYKEM
STEEL BLUE
Stops Losses
making Dies and Templates
Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.
Write for sample on company letterhead
THE DYKEM COMPANY
2303L North 11th St. • St. Louis 6, Mo.
DYKEM STEEL BLUE
SPECIMEN
With DYKEM Steel Blue
Without DYKEM Steel Blue

CIRCLE INFORM-A-GRAM KEY NO. 1002

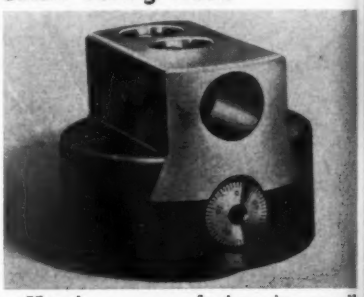
YOUR INFORM-A-GRAM CARD FOLLOWS PAGE 86 IN THIS ISSUE

Product News

Box Finger Brake

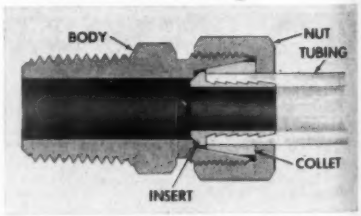
The new 12" Di-Acro box finger brake has undercut box fingers and 1" clearance through the top opening. It'll take up to 16 ga steel and can be set up as a box finger brake, bar folder, radius former, and open end former, says O'Neil-Irwin Mfg. Co., 626 Eighth Ave., Lake City, Minn. Get details. Circle No. P27.

Small Boring Head



Here's a new design in small boring heads. The double-hole bar holders come in 2", 3", and 4" dia. This DBL-102 head features cross holes to permit the boring of extra-large holes. Details are available from Criterion Machine Works. Costa Mesa, Calif., or Circle Inform-A-Gram No. P28.

Trouble-Free Fitting



The new Viseal brass fitting for plastic tubing has an insert-collet to provide positive locking of leak-proof connections. Get details from Commonwealth Brass Corp., 5835 Commonwealth Ave., Detroit 8, Mich., or Circle No. P29.

A simple, effective, low cost
ANTI-CORROSION TREATMENT
during storage, production and shipment

CRC

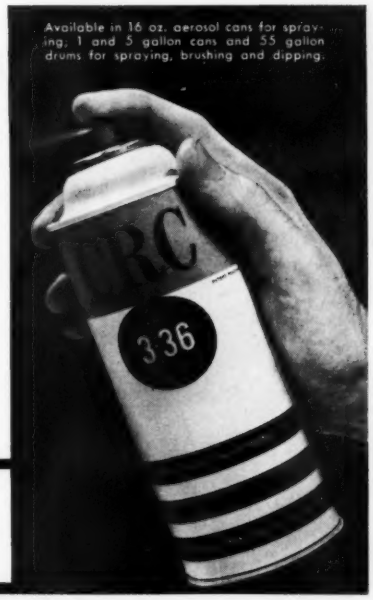
FORMULA 3-36 METALS INDUSTRY

A molecular film that first displaces moisture from grain boundaries, pores and cracks and then seals the surface against corrosive action, CRC 3-36 keeps metal surfaces new. Easily applied by spray, brush or dip, CRC 3-36 never becomes hard or brittle, normally need not be removed when metal is subsequently processed. Non-irritating and non-toxic to humans, has faint pleasant odor.

Also preserves tools, dies and fixtures, loosens "frozen" parts, has beneficial lubricating effect.

WRITE TODAY!

Send for free copy of CRC 3-36 Bulletin which gives complete product specifications and describes cost-saving applications.


Available in 16 oz. aerosol cans for spraying, 1 and 5 gallon cans and 55 gallon drums for spraying, brushing and dipping.
CRC
3-36

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CORROSION REACTION CONSULTANTS

Specialists in Anti-Corrosion Treatments

116-G Chestnut Street, Philadelphia 6, Penna.

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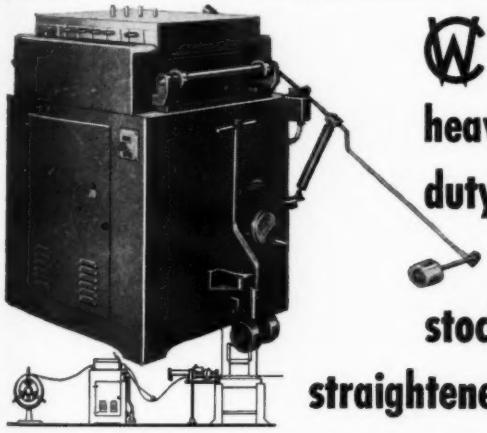

heavy duty stock straighteners

Cooper Weymouth variable speed power driven stock straighteners can increase production and reduce costs by removing coil stock curvature before feeding to presses, shears and four-slide machines.

All heavy duty models are portable, cabinet type; most take stock up to 3/16" thick and are made in stock width sizes of 12, 18, 24 and 36 inches. Free loop arm can synchronize straightener speed to that of other equipment.

Ask about other Cooper Weymouth time saving production equipment, designed to increase output, decrease costs.

COOPER WEYMOUTH, INC.

603 Honeyspot Road, Stratford, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 1012

WRITE NOW FOR THIS

FREE CATALOG

ON WORK HOLDING TOOLS FOR PRODUCTION, TOOLING, MAINTENANCE

Drill press vises, angle vises, swivel machine vises, rotary tables, lathe milling attachments, production vises, heavy duty angle vises, and adjustable angle plates are illustrated and fully described in the New Palmgren Catalog. This is the only complete line of work holding devices available anywhere. Designed for production, tooling, and maintenance work, there are 68 different models and types to choose from. Vise jaw sizes are from 1½" to 8". Ask for your copy of this FREE Catalog No. 205 today. The complete line with details and prices are shown.

PALMGREN PRODUCTS

by CHICAGO TOOL AND ENGINEERING CO.

8388 SOUTH CHICAGO AVE • CHICAGO 17, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 1013

*Of course, it's tough to toe such a fine tolerance line! But Acme Industrial has produced scores of parts, big and small, that meet just such exacting requirements . . . and we're talking about high volume output! America's missiles, dependent on thousandths-of-an-inch accuracy, incorporate many Acme-made parts. To lay it on the line, very, very few production lines have the number and variety of machines . . . the more-than-a-decade experience . . . the proved reputation for Nth degree production ability. These unique Acme capabilities can work for you.

Whatever the manufacturing job . . .
• valve and sleeve assemblies
• carbon assemblies • housing assemblies
• seals • nut assemblies—to list a few
. . . Acme's jobbing division does it best.

ACME INDUSTRIAL COMPANY
204 North Laflin, Chicago 7, Ill.

SEND... your new-off-the-presses FREE facilities book to me. I'd like to see what your equipment is, what you've done, how it can help our operation.

Name_____
Firm_____
Address_____
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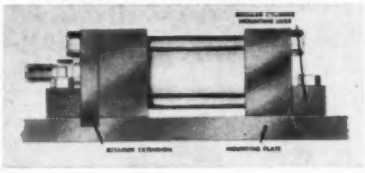
CIRCLE INFORM-A-GRAM KEY NO. 1021

Product News

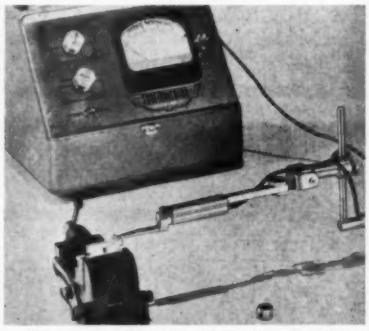
Sturdy Cylinder Mount

TOOLING & PRODUCTION



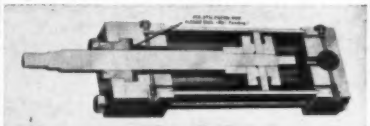
This simple rugged power cylinder mounting permits speedy installation and won't shift under heavy loads. Its extending flange plate slips into a slot in a machine mounting surface. For literature, write Miller Fluid Power Div'n, Flick-Reedy Corp., York and Thorndale Rds., Bensenville, Ill., or Circle Inform-A-Gram No. P30.

Chisel Point Adapter



A new adapter for the Surfindicator surface finish measuring instrument has a chisel point, which permits surface measurements of cutting edges, knife edges, and components with very small ID's, such as coil winding wire. It's Model BL-130, available from Brush Instruments, Div'n of Clevite Corp., 37th & Perkins, Cleveland 14, Ohio. For details, Circle Inform-A-Gram No. P31.

Cylinder Rod Seal



Air cylinder assembly and rod seal field replacement are simplified with the new Sta-Dyn seal used on Miller air cylinders. It combines rod flange seal and rod bushing sealing ring into a one-piece unit. Write Miller Fluid Power Div'n, Flick-Reedy Corp., York and Thorndale Rd., Bensenville, Ill., or Circle No. P32.

*Acme Industrial figures your time is money. So . . . Acme saves it for you. The FREE Lock Screw Locating Jig instantly gives location for lock screw drilling and tapping. Handy? You bet. Free? Honest. A daily time and work saver? Certainly. No, Acme bushings (all 30,000 sizes of them) aren't free, too. But just as important, they're close as your nearby Acme distributor. Fastest delivery standard . . . finest quality (a tradition) expected . . . dependable precision remarkably perfect.

ACME INDUSTRIAL COMPANY
204 North Laflin, Chicago 7, Ill.

SAVE... my time and work! Send me a FREE Lock Screw Locating Jig. No obligation, of course.

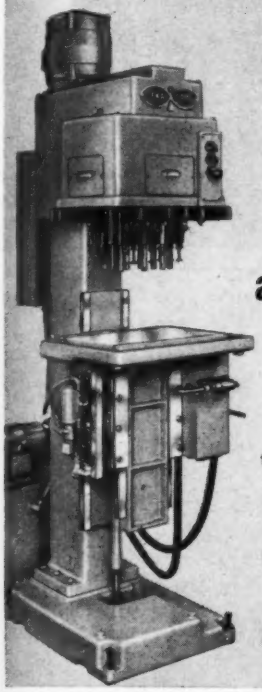
☐ Send your bushing catalogs, too.

Name_____
Firm_____
Address_____
City_____ Zone____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 1022

DEKA DRILL

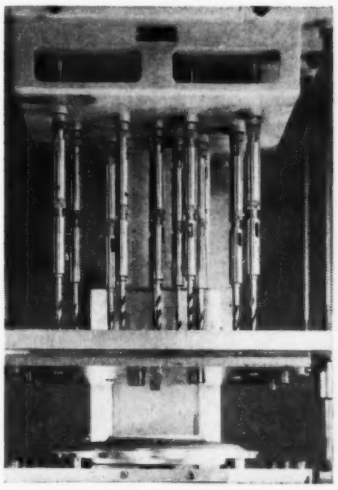
HYDRAULIC MULTIPLE SPINDLE DRILLING and TAPPING MACHINE



Send us one of your drilling or tapping problems for a free time study estimate. Find out how automatic cycle drilling and tapping with DEKA-DRILL can increase production and save time and money for **you!**

ELEVEN HOLES IN EIGHT SECONDS WITH DEKA-DRILL!

COMPANY: Continental Motors Corp., Detroit, Michigan.



OPERATION: Drilling eight 11/32" holes .480 deep and three letter "I" holes .780 deep in a malleable iron part.

TIME OF COMPLETE OPERATION: 16 SECONDS!

FLOOR TO FLOOR TIME: 32 SECONDS!

TECHNIQUE: Work piece is clamped automatically during drilling cycle by three pressure pads on bushing carrier mounted to top leaf of die-set. Bushing carrier and locating nest plate can be easily and swiftly removed and replaced to accommodate unlimited number of different work pieces.

PRECISION TOOL AND MFG. CO. of ILLINOIS

DEPT. TP70, 1305 S. LARAMIE AVENUE, CICERO 50, ILLINOIS

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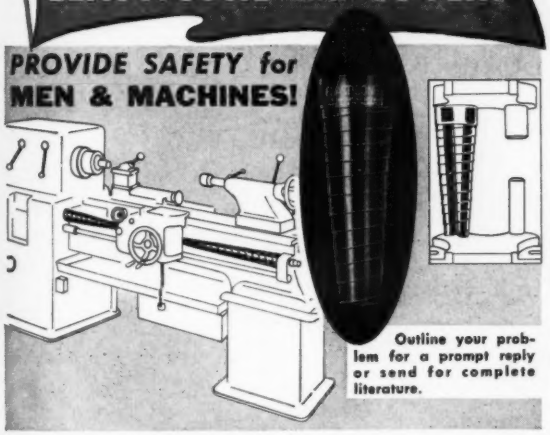

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Elasticones are metal-formed, cone shaped covers that open and close automatically to provide protection against dirt, damage, and catching of limbs, for all precision moving parts. Available in all finishes and sizes from ⅜" diameter up to 60" long.

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Will Repeat within 50 millionths of an inch

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INTERNAL COMPARATOR

READING DIRECTLY IN 50 MILLIONTHS OF AN INCH

SMALL BORE GAGES	With interchangeable, springloaded Split Jaw Measuring Heads	
	Range .059" to .160"	$88.50
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LARGER SIZES	Employing a springloaded bridge, as illustrated	
	Range .400" to .700"	$72.50
	" .700" to 1.400"	67.50
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Complete in Hardwood case, without gaging head. Extra for gaging head reading in .000050" . . . $37.50 which may be interchanged in the various sets. Other heads reading in 20 millionths or .0005" available.

OTHER SIZES BORE GAGES | Up to 32" in diameter and 88" hole depth

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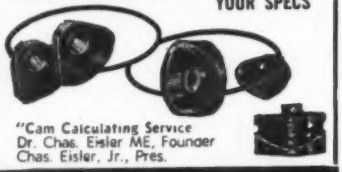

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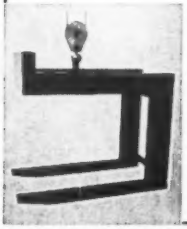

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Polish . . . Buff . . .
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Oscillating
BELT GRINDER

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MINIATURE DRILL BUSHINGS
Hole Sizes—No. 80 to 3/32"
O.D. 3/32" to 13/64"
Lengths 1/4" to 3"
.0002 Tolerance on I.D.
O.D., and Concentricity
Specials to your specifications
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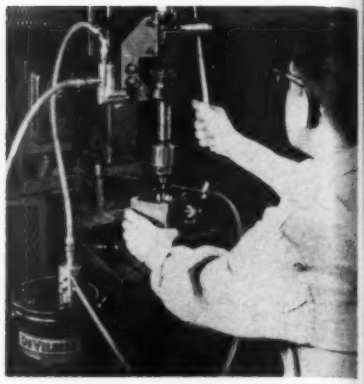
CIRCLE INFORM-A-GRAM KEY NO. 1045

Product News

Mist Coolant Kit

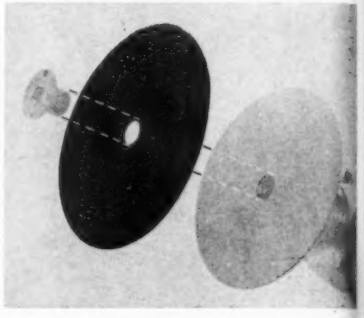
This Multi-Mister mist coolant device features an intermittent spray, which cuts coolant and air waste and provides for cleaner operation because the mist is off during machine tool loading and unloading operations. For details, contact The DeVilbiss Co., Toledo, Ohio, or Circle Inform-A-Gram No. P33.



Face Mill Kits

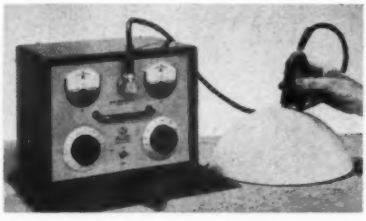
Packaged kits of 6 carbide face mills with integral 3/4" shanks, packed in pairs in a protective wood cabinet, are announced by Niagara Cutter Div'n. of Bollier-Damerell Inc., 330 Niagara St., N. Tonawanda, N. Y. They're available in various combinations to various machining jobs. Get details, Circle No. P34.

Grinding Discs



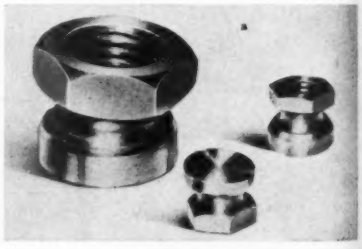
Better surface finishes are said to result from using Red Coat resin fibre discs made by Michigan Abrasive Co., 11900 E. 8-Mile Rd., Detroit 5, Mich. Strengthened disc mounting holes minimize the appearance of "intra-oscillating" effects. For data, write the company, or Circle No. P36.

Probe for Plastics

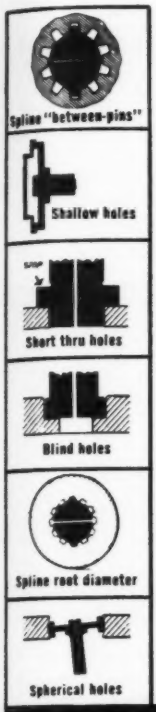


Non-destructive examination of finished parts made of plastics and other insulating materials is done quickly with the Model 168 D-K Analyzer. Use it either as a portable or a bench-operated tool. Write Delsen Corp., 719 W. Broadway, Glendale 4, Calif., or Circle Inform-A-Gram No. P35.

Toggle Pads



True alignment of Jergens toggle pads is possible because they incorporate a new holding principle which prevents nut oscillation from disturbing pad location. The new pads true up all clamping on irregular and angular surfaces with maximum accuracy. For details, write Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland 10, Ohio, or Circle Inform-A-Gram No. P37.



Whether you need a precision gage for plain round holes . . . or "specials,"

THIS EXPANSION-PLUG GAGE IS WONDERFULLY ADAPTABLE

EXPANDING COMTORPLUG IS READILY ADAPTED TO YOUR SPECIAL NEEDS.

Here is the only gage that makes between-pins gaging of splines as simple and precise as gaging a plain round hole. By simple adaptations, it fits many special needs encountered in volume-precision programs. And for plain round holes from ⅛" to 10" diameter . . . at machine, in chuck, or at bench . . . it gives precise automatic 2-point gaging of all parts of a bore. It shows up exact amount of any front or back taper, ovality, barrel shape, bell mouth, etc. Applied by the thousands in aircraft, electronic, automotive, electrical, household appliance and other fast-moving programs, Comtorplug may be exactly suited to your needs. For details write . . .

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For holes ⅛" to 10" diameter

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COMTORPLUG with interchangeable expansion plugs to gage simple or special holes to a fraction of .0001".

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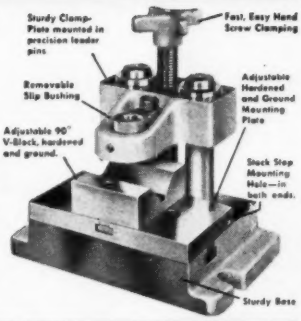
ADJUSTABLE V-BLOCK DRILL JIG

Saves Set-Up Time— Increases Output

Here is a versatile and accurate V-Block that makes center and off-center drilling, tapping, and reaming easy and precise. Four-way V-block adjustment simplifies handling a wide range of work. Fast, easy positioning and clamping speed production. A centering locator plug and T-slots in the mounting surface plates assure fast, easy, on-center adjustment. Drill capacity #80 to ¼" diameter. Handles stock from ¼" to 2" diameter.


Sturdy Clamp-Plate mounted in precision leader pins
Fast, Easy Hand Screw Clamping
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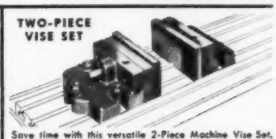
Adjustable Hardened and Ground Mounting Plate
Adjustable 90° V-Block, hardened and ground.
Stock Stop Mounting Hole—in both ends.
Sturdy Base

TRUE-CENTER ADJUSTABLE TOOL HOLDER

The REPCO Adjustable Holder is a precision-built tool, having two-piece construction which provides fast adjustment of the main body to compensate for as much as ½" machine misalignment. Cuts down on tool wear, breakage, and scrap.

TWO-PIECE VISE SET

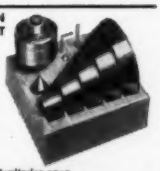


Save time with this versatile 2-Piece Machine Vise Set. Use as general-purpose vise, angle-block, or separate clamping device. Opening limited only to length of machine base. Light, accurate, rigid. Two sizes: 6" and 8".

CHUCK JAW TRUING-RING SET

This Ring Set saves time, cuts cost of boring jaws. With correct diameter rings at hand, you gain hours of productive time. Plated rings range from 1" to 4" by ⅛" increments. Handy peg-type rack keeps rings in place.

COMBINATION LIVE-CENTER SET



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- ELIMINATES READING ERRORS

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Producto Precision Toolroom Vise

MANY ADVANTAGES:
Very strong • Lightweight (just 13 lbs.) • Low frame, 2" • Wide jaw opening, for heavy or light work • All surfaces hardened and ground at right angles and parallel.

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Product News

Counterbore Set

Specially arranged to suit the new standard for socket head screws, the No. 1B standard tool room set contains counterbores to suit screw heads #6 through 5/8"

dia, together with necessary pilots and holders. Three countersinks for 60°, 82°, and 90° included angle are also provided. Get details from Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich., or Circle Inform-A-Gram No. P38.

Drill Presses

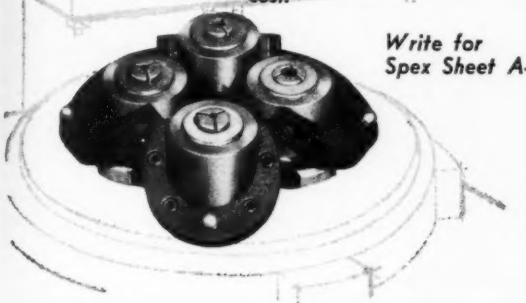
Up-front controls permit one-hand operation of a new line of Delta 20" power-feed drill presses. Available in 18 models including

bench, floor, multiple spindle, and overhead track-mounted types, they have a connection for spindle control of rotary tables and other devices. Write Rockwell Mfg. Co., Delta Power Tool Div'n, 470 N. Lexington Ave., Pittsburgh 8, Pa., or Circle No. P39.

NEW small ZAGAR HOLDING FIXTURES...

designed for Small Indexing Tables

Closer spacing of several fixtures on *small* index tables is now possible with Zagar's new line. Height: 2⅜"; flange area: 3¾" dia. Horseshoe handle has hardened operating cam button. Take advantage of automatic small parts machining at low cost.



Write for Spex Sheet A-7.

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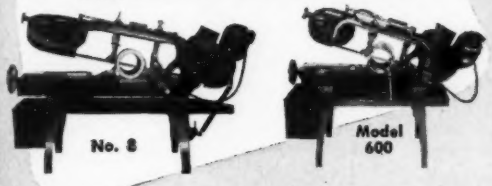

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The simple design and rugged construction of every "Wellsaw" didn't just happen. We planned it that way! Over 30 years of specialized band saw experience and know-how is your assurance of the quality and service with each machine produced by Wells Manufacturing Corporation.

There is a Wells Saw of the right style, capacity and speed to do a better, more economical job for you. Wells Saws will deliver long, dependable service. Operating and maintenance costs are very low. See your Wells Distributor.

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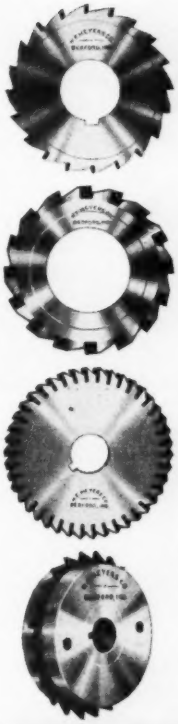

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It costs no more to enjoy the production advantages of MEYCO tools: "precision" minded since 1888, careful workmanship, well equipped shops and capable design engineers . . . all add up to plus values for you.

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Your special problems in the field of cutting, slitting, slotting, under-cutting or form-cutting are solicited.

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by A. D. Merriman

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Many uses — —core pins, punches, gages, ejector pins, insert pins, special tools, etc. — Quick delivery.

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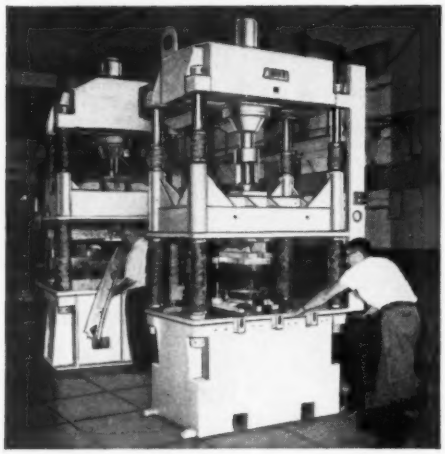
CIRCLE INFORM-A-GRAM KEY NO. 1081

Two DAKE DIE TRYOUT PRESSES in Custom Die Shop?



Greenville Tool & Die Company, Greenville, Michigan, purchased a 150-ton Dake Hydraulic Die Tryout Press to relieve the workload on their mechanical facilities. After delivery, management discovered that the backlog of work for the Dake press was far greater than it was for the mechanical presses. Its smooth, accurate operation enabled it to easily handle press work that would otherwise be difficult or impossible. A second Dake Hydraulic Die Tryout Press was installed because *no other press could do as much work so well.*

The Dake Die Tryout Presses can be stopped and reversed at any point in the stroke—diemakers can see just when and why blanks are "dragging" or "tearing," and their large daylight area allows the die to be "barbered" without removing it from the press.

At the Greenville Tool & Die Company, Dake presses are also used to align punches, "shear-in" irregularly shaped surfaces, develop blank sizes and shapes, find the right redraw depths, and even straighten heat-treated die parts.

Dake Die Tryout Presses are available in 9 standard models from 25-ton to 300-ton capacity, and in custom engineered models to 600-ton capacity to meet special requirements. Send for Bulletin No. 330 for specifications.

DAKE CORPORATION, 634 Robbins Road, Grand Haven, Mich.

Arbor Presses
Hand-Operated Hydraulic
Power-Operated Hydraulic
Guided Piston
Gap Type Presses
Movable Frame

DAKE PRESSES

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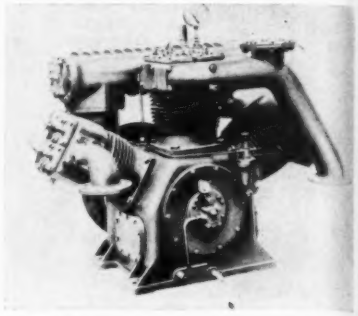
CIRCLE INFORM-A-GRAM KEY NO. 1082

Product News

Air Compressors

Atlas Copco's new CR-series of all-purpose air compressors deliver 174 to 338 cfm. Designed for heavy-duty, 3-shift operation, they



may be permanently installed or operated on skid mounts. The machines are rated for working pressures up to 125 psi. For details contact the company at 545 Fifth Ave., New York 17, or Circle Inform-A-Gram No. P40.

Resurface in Seconds

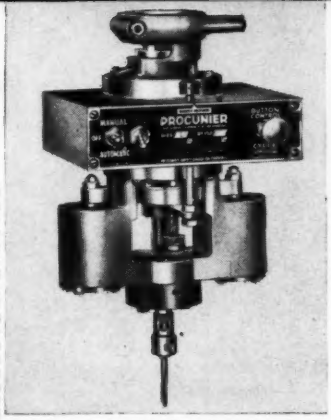
Dies and other surfaces damaged by metal pickup or galling may be resurfaced in seconds by use of Target Lube, a new universal type lubricant, available as a stick or in a pressure-spray can. It deposits

a film of hard, smooth metal which, under the heat of friction, becomes a part of any metal surface to which it is applied. Write the Chemical Lubricants Co., Royal Oak, Mich., or Circle Inform-A-Gram No. P41.

YOUR INFORM-A-GRAM CARD FOLLOWS PAGE 86 IN THIS ISSUE.

TAP GAUGE PERFECT PARTS *Everytime!*

NEW Lead Screw Tapper



with Finger Tip Push Button Controls permits you to tap any quantity of practically any material, with absolute precision, without rejects, without stripped threads or distortion. Tests have shown it produces parts that pass 100% inspection — 100% acceptable! The secret is in the tap control mechanism which feeds the tap automatically without any pressure. The Lead Screw controls the tap and guides it steadily through each cycle, guaranteeing supreme accuracy. In addition, it offers convenient 5-way operation; pushbutton and foot control for complete cycle or jog automatic (without foot or hand controls) or with switch fixture for full cycle. Either way, you get uniformity, speed and precision that's unparalleled!

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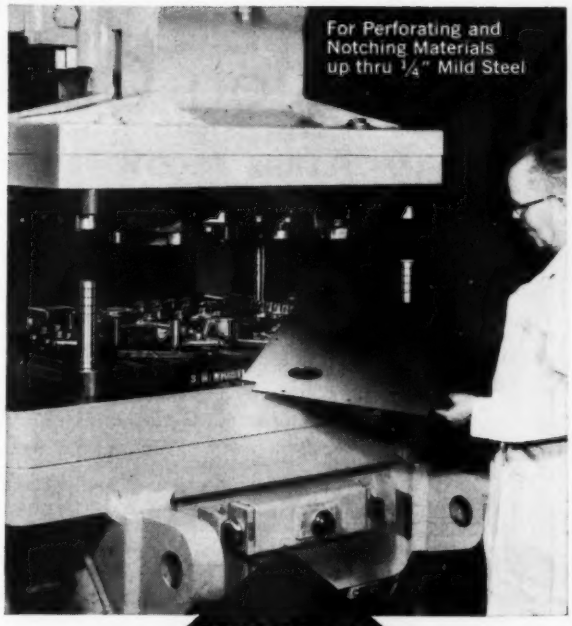

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1 operation—
instead of 2!

Burr-Bit by Vernon Devices is made of the finest quality high speed tool steel. It fits all 2, 3 and 4 flute taps, and can be used on almost any material.

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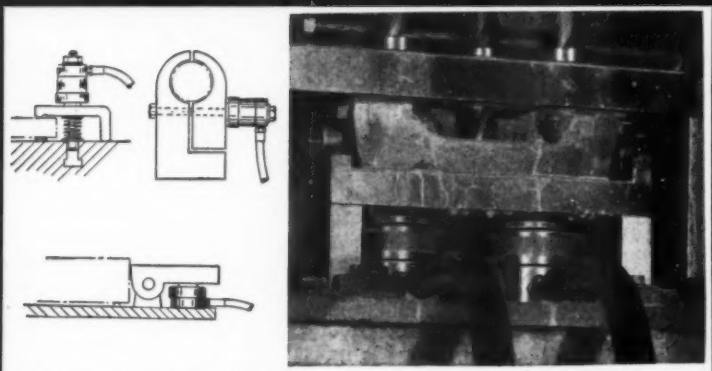

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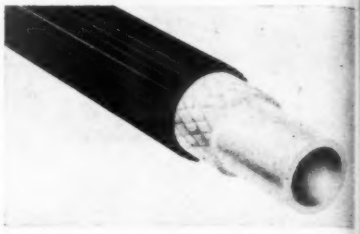
CIRCLE INFORM-A-GRAM KEY NO. 1102

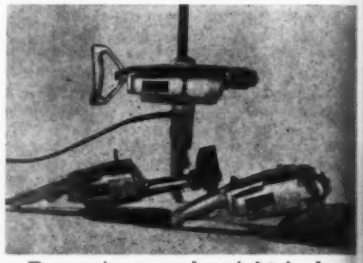
Product News

Pressure Hose



This new Synflex pressure hose can be used as original equipment or for maintenance-replacement in a wide range of hydraulic and pneumatic applications requiring a lightweight, flexible hose. Available with core tube ID of 3/16" in 1/16" increments through 3/8", it will handle all fluids normally encountered. Get more data from Synflex Products Div'n, Samuel Moore & Co., Mantua, Ohio, or Circle Inform-A-Gram No. P42.

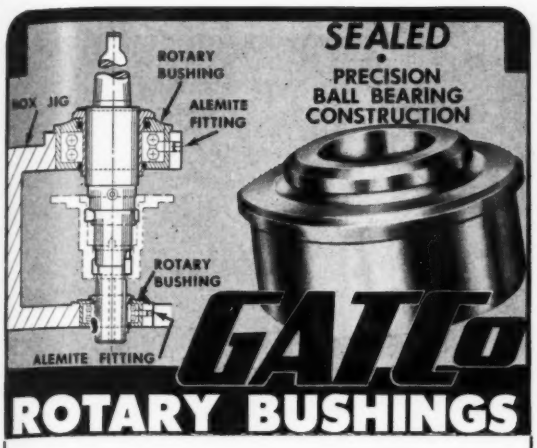
Portable Power Tools



Power is up and weight is down in the new line of 16 portable power tools by Stanley Electric Tools, Div'n of The Stanley Works, New Britain, Conn. The line includes 10 heavy-duty drills, three heavy-duty disc sanders, a 7" polisher, and two grinders. For a catalog, Circle No. P43.

Hand Bender

Square and round shapes can be formed in less than 1 sec with this new B-050 Series hand bender. It takes only minutes to set up and has a capacity of 3/8" steel. Get more information from W. V. Industries Div'n, Vemaline Products Co., P. O. Box 222, Hawthorne, N. J., or Circle No. P44.



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The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work — or both.

Eliminates expensive tool construction — Reduces tool wear — Prevents seizure and pilot breakage — Especially adapted where precision is required.

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15 kw; 30 kw.

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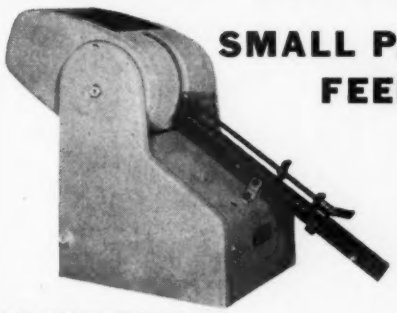
HOPPERAL



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Automates your operation by continuously supplying parts which are properly oriented for machining, assembly and packaging. Gentle oscillating action of "HOPPERAL" assures trouble free feeding of parts. Unit shown has adjustable escapement to release one or more parts at a time.

REDUCE ASSEMBLY COSTS

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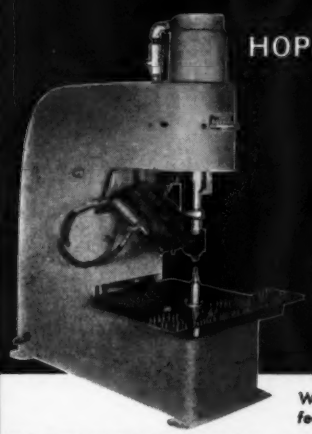
Available with any number of tracks to feed parts to assemblies or other operations where a large quantity of parts is required simultaneously. Can be partitioned and supplied with properly designed tracks to feed unlike parts.



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The Hopperal parts feeder will feed screws, nuts, bolts, rivets, nails and other fastening devices for many assembly operations.

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Product News

Blade Saves Downtime

Wear resistance and cutting rates are increased with a new alloy steel band saw blade designed for standard band saws and for automatic cut-off machines. They save blade-changing down-time and are effective on tough alloy steels. Get details on the Lenox Master-Band from American Saw & Mfg. Co., Boylston and Emery Sts., Springfield, Mass., or Circle Inform-A-Gram No. P45.

High-Temp Paint

Temperatures up to 1700°F won't harm Heat-Rem H-170 Super paint. It can be sprayed, dipped, or brushed on welding jigs, fixtures, and formed parts. Aluminum or clear vehicles are available. Write Speco, Inc., 7308 Associate Ave., Cleveland 9, or Circle Inform-A-Gram No. P46.

Protective Paper

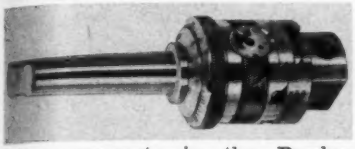
Any type of finish can be protected with KB pressure sensitive paper. It comes in stretchable and non-stretchable types and is easily applied without wrinkling or bubbling. Get data from Tech-Industro Co., 415 W. Pike St., Phila. 40, Pa., or Circle No. P47.

Midget Hand Pump

A new, compact hydraulic hand pump that develops 8650 psi is 14 5/16" long and has an oil capacity of 13.5 cu in. The No. Y28-A pump provides fast and efficient operation for the new 2- and 4-ton capacity single cylinder rams, which have recently been added to the OTC line. For details, write to Owatonna Tool Co., 547 Cedar St., Owatonna, Mich., or Circle Inform-A-Gram No. P48.

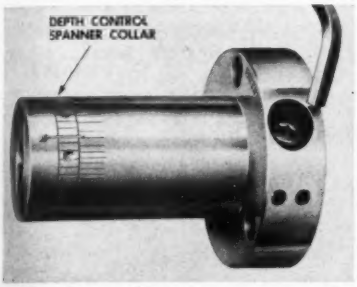
Product News

Boring and Facing Head



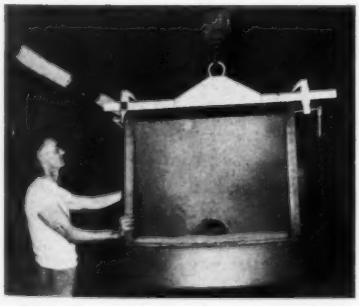
Improvements in the Duplex combined boring and facing tool heads include a new means of attaching the shanks to the body, shorter body height for greater rigidity, and a method for take-up for wear which keeps the tool in proper adjustment at all times. Details from Chandler Tool Co., Muncie, Ind., or Circle No. P49.

Precision Boring Quills



Hex-key adjustment on newly designed boring quills permits "splitting tenths" without loosening or tightening any toolholder screws. A depth-control adjustment can be incorporated in the quill when required. Get more data from Briney Mfg. Co., 1165 Seba Rd., Pontiac, Mich., or Circle Inform-A-Gram No. P50.

Versatile Lift Tool



Rapidly and firmly clamped by hand, three types of Gonser clamp-on lifting tools speed up handling, conserve time, and save money. They lift, transfer, pull, turn over, rotate, and position a variety of jobs. Write James Campbell Smith, Inc., 4057 Erie St., Willoughby, Ohio, or Circle No. P51.

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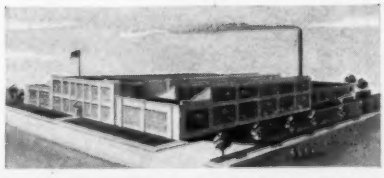

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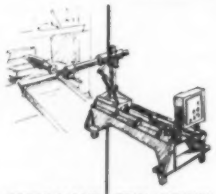
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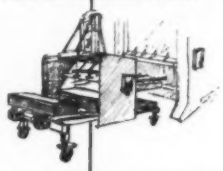
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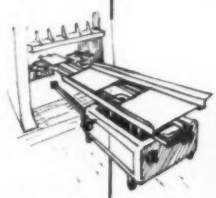
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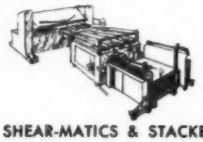
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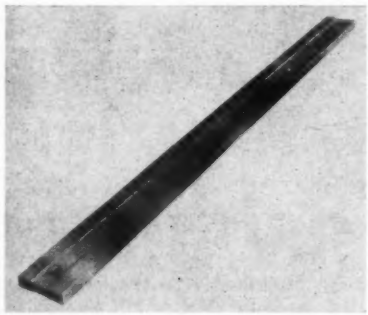
Product News

Tough Shear Blades

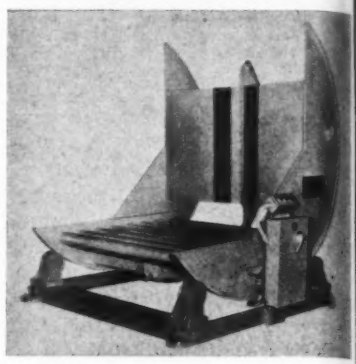
Longer runs between grinding and burr-free cutting are benefits enjoyed by users of O-Kni-Co solid or composite steel shear blades. The specially hardened



blades are made in three grades to fit practically any shear for a variety of shearing operations. They're also for wear parts. For details write Dept. JJ-206, Ohio Knife Co., Cincinnati 23, or Circle Inform-A-Gram No. P52.

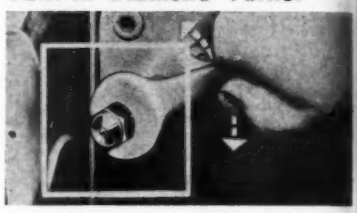
Coil Handler

Coil handling costs are reduced with the Upender, a new device for rotating coiled strip so it can be transported and stored in a



vertical position. It eliminates the need for hoists, slings, or cradles when unloading coils from trucks. Roth Corp., Box 29, New London, Ohio, or Circle No. P53.

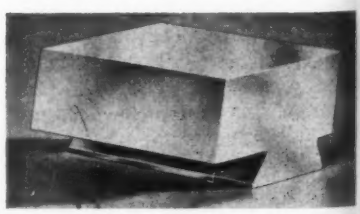
Built-in Diamond Turner



Useable diamond life is extended up to four times by use of the Turnable diamond tool. It has a built-in turner head which provides proper diamond turning without need for repositioning the tool. Get more information from the Cleveland Industrial Tool Co., Chardon, Ohio, or Circle P54.

Tool Blanks

Standard size dovetail form and shave tool blanks for automatic bar machines are now offered by The Somma Tool Co., Inc., 109 Scott Rd., Waterbury, Conn. Both types are available in HSS or T-5 Super HSS. They're ground and heat treated for maximum cutting life. Write the company, or Circle Inform-A-Gram No. P55.

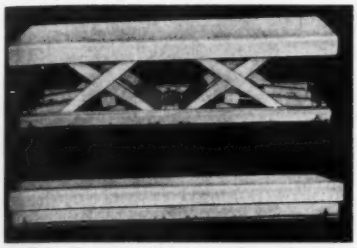


Product News

Pressure Regulator

This foot-operated pressure regulator is self-relieving and controls up to 125 psi air pressures. It's provided with 10' of flexible plastic tubing for connection with supply and output lines. Get more information from Air Specialty Co., 1508 Dorothy Drive, Palatine, Ill., or Circle Inform-A-Gram No. P56.

Heavy-Duty Lift Table



This 24,000 lb capacity Southworth lift table is hydraulically-powered and has a scissor type lifting mechanism. Collapsed height of the model LT-12 is only 8½"; extended height, 40". Write Southworth Machine Co., 30 Warren Ave., Portland 2, Me., or Circle No. P57.

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When writing to any of the above locations, refer to Dept. E-7

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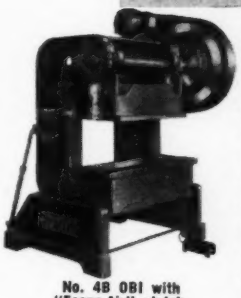

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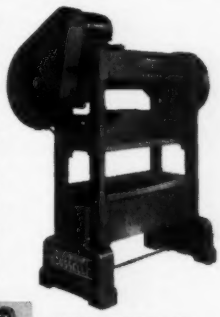

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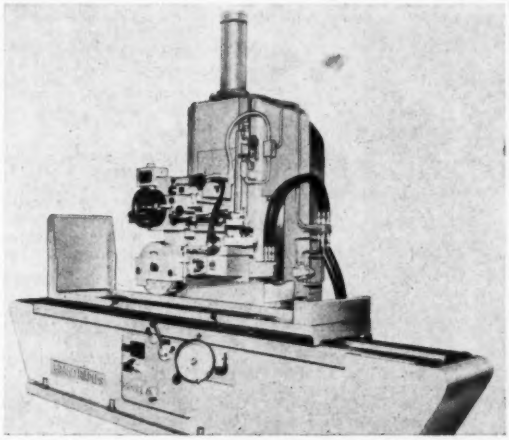

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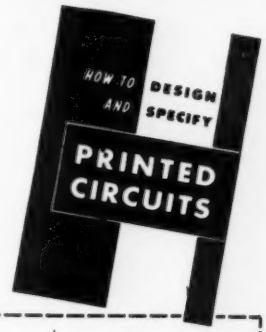

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SUBJECT INDEX

Assembly
Q-C for, Feb., p. 66 (3 pp.)

Boring
Cartridge-type tooling, with, Feb., p. 53 (2.4 pp.)
Chip removal, after, Feb., p. 43 (.66 p.)
Methods and machines, special engineering report on, June, p. 56 (11.34 pp.)
Tool and gage setup for accuracy in, May, p.61 (2 pp.)

Broaching
Progressive, tooling for, June, p. 51 (1.33 pp.)

Carbides
Cartridge-type, for boring and facing, Feb. p. 53 (2.4 pp.)
Common sense use of, Feb., p. 49 (1 p.)
Machining hi-temp alloys with, Feb., p. 51 (1.9 pp.)
Machining tungsten with, Feb., p. 56 (3 pp.)
Throwaway tools, positive rake chip-breaker grooves in negative rake inserts, for doubled life, Apr., p. 62 (1.0 pp.)
Use of, Feb., p. 9 (1.16 pp.)

Ceramics
Machining with, June, p. 48 (2.9 pp.)

Cold Forming
Heading, fast, of tiny parts, Feb., p. 65 (.7 p.)
Swaging, choosing a machine, Feb., p. 59 (3 pp.)
Swaging, tooling for, May, p. 59 (3 pp.)

Controls
Numerical, programming for drilling, Apr., p. 58 (4.0 pp.)
Tape, and common sense, Jan., p. 35 (1 p.)
Tape, for milling machine, Jan., p. 48 (2-1/2 pp.)
Tape, of Natco drill, to speed production, Mar., pp. 55 (2 pp.)

Computers
Operation of, for production jobs, Jan. p. 43 (5 pp.)

Cost Cutting
Production change, by, Feb., p. 46 (.4 p.)

Dies
Lamination, plus assembly, Jan., p. 37 (5 pp.)
Progressive, designs for two, Mar., p. 57 (3 pp)
Progressive, for brass telephone parts, Apr., p. 65 (1.66 pp.)
Punch system for, Mar., p. 65 (.66 p)
Swaging, design of, May, p. 59 (3 pp.)

Drilling
Building-block machine for, Jan., p. 42 (1 p.)
Programming for numerically controlled, Apr., p. 58 (4.0 pp.)
Tape controlled, at Solar Aircraft, Mar., p. 55 (2 pp.)
Turret machine, with 183 spindles, May, p. 70 (1 p.)

Fixturing
Milling machine, for tape controlled, Jan., p. 48 (2-1/2 pp.)

Grinding
Lapping, a clue to, of irregular surfaces, Apr., p. 57 (1.0 p.)
Machine for 60" OD-ID cylindrical and face, May, p. 48 (1 p.)
Machine, new, double-spindle disc type, with, Apr., p. 64 (0.5 p.)
Wheels, lubricant for, Apr., p. 66 (.33 p.)
Thin parts, of, Mar., p. 64 (1.33 pp)

Heat Treating
Tool performance aided by, May, p. 54 (3.66 pp.)
Tool steels, of, Mar., p. 51 (4 pp)

Machine Tools
New Warner & Swasey automatic chucker, June, p. 52 (.66 p)
Standardizing dimensions of, June, p. 47 (1 p.)

Machining
Ceramic tools, with, June, p. 48 (2.9 pp.)
Faster speeds, design linked for economy, Mar., p. 48 (3 pp.)
Hi-temp alloys, of, Feb., p. 51 (1.9 pp.)
Titanium, of, May, p. 63 (3.34 pp.)
Tungsten, of, Feb., p. 56 (3 pp.)

Maintenance
Machine, scheduling, for, Feb., p. 62 (1.3 pp.)

Management
Businessman's role in political action, Mar., p. 7 (2 pp.)
Depreciation, understanding of, Feb., p. 41 (2.3 pp.)
Executive appraisal, Apr., p. 55 (2.0 pp.)
European expansion, cash in on, Mar., p. 45 (2.66 pp.)
Foreign competition vs. standard of living, Jan., p. 33 (1 p.)
Inventions, who owns, Jan., p. 58 (1-3/4 pp.)
Maintenance, makes money, Apr., p. 9 (2.5 pp.)
Leasing, J & L Plan for, Feb., p. 63 (.66 p.)
Supervisory development, Mar., p. 61 (2.25 pp.)
Value Engineering, a tool, Feb., p. 39 (1 p.)

Marking
Contoured stencils speed part marking, June, p. 55 (1 p.)
Electrolytic, on a production basis, Jan., p. 56 (2 pp.)

Milling
Tape controlled, tooling up, Jan., p. 48 (2-1/2 pp.)

Plating
Brush-on, versatile, Mar., p. 76 (1 p.)

Pneumatics
Circuits, fill-in approach to, Mar., p. 66 (5 pp.)

Pressworking
Die, carbide, for laminations, Feb., p. 50 (1 p.)
Laminations, of, and assembly, Jan., p. 37 (5 pp.)

Quality Control
Automatic inspection and sorting of tiny parts for, Feb., p. 47 (2 pp.)
Bonus plan for, May, p. 49 (1.7 pp.)
Caliper, for measuring undercut walls, Feb., p. 70 (.66 p.)
Heavy assembly, for, Feb., p. 66 (3 pp.)
Managing, for profits, Jan., p. 9 (2 pp.)
Portable torque tension tester used for, June, p. 69 (.7 p.)
Systems, installation of, May, p. 43 (5 pp.)
Workmanship, May, p. 41 (1 p.)

Reaming
Close tolerance, Mar., p. 60 (1.33 pp)

Reliability
Reliability—A new tool, May, p. 9 (1.86 pp.)

Spinning
'Big Stuff', hot- and cold, Jan., p. 52 (2 pp.)

Threading
Machines, indicator for alignment of, Apr., p. 67 (1.00 pp.)

Tooling
Cut-rate, and methods, Apr., p. 51 (3.75 pp.)
Hydraulic combinations save time, Apr., p. 63 (1.5 pp.)
Use of nylon for, June, p. 53 (2 pp.)

Tool Steels
Selection and heat treatment of, May, p. 55 (3.66 pp.)

Transfer machine
Chip removal, in, Feb., p. 43 (.66 p.)

Turning
Automatic, with new turret lathe, Feb., p. 55 (.6 p.)
Indicator for, Feb., p. 64 (1.3 pp.)
Fully powered, with new VTL, Jan., p. 36 (1 p.)
Screw machine, with, to eliminate second operations, Feb., p. 44 (2.6 pp.)

Ultrasonics
Sonic energy as a production tool, June, p. 7 (2 pp.)

Welding
Machine tool bases, of, plastic models for stress analysis in, May, p. 51 (3 pp.)
Titanium, of, May, p. 63 (3.34 pp.)

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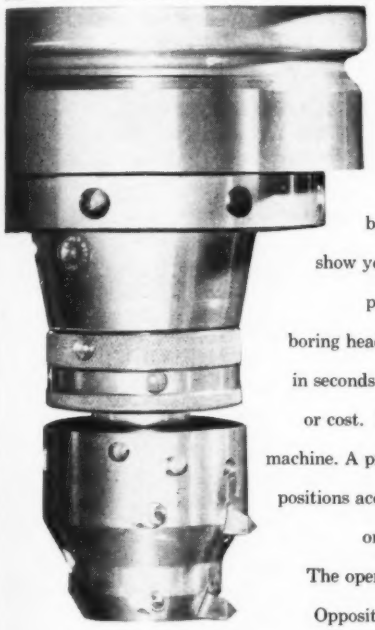

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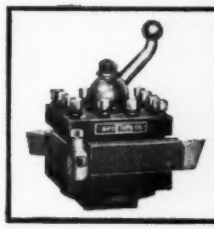

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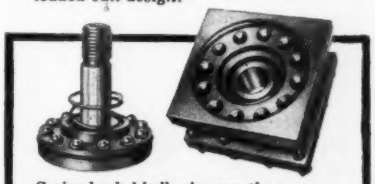

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ADVERTISERS' INDEX

Ace Drill Corporation 112
Acme Industrial Company 102
Acme Tool Corporation 98
Aget Manufacturing Co. 99
Alina Corporation 83
Allegheny Ludlum Steel Corp. 36
Alva Allen Industries 113
Allenair Corp. 105
American Drill Bushing Co. 120
Anderson Bros. Mfg. Co. 89
Armstrong Brothers Tool Co. 91
Atlas Press Company, Clausing Division 34

Balas Collet Mfg. Co. 119
Bald Eagle Corporation 117
Bausch & Lomb Optical Co. 8, 21
Bellows Company 13
Besly-Welles Corp. 67
Burg Tool Mfg. Co. 56
Burgmaster Corporation 86
H. L. Bushman Co., Inc. 104

Central Safety Equipment Co. 103
Chicago Tool & Engrg. Co. 101
Cincinnati Milling Machine Co. 55
Clausing Division Atlas Press Company 34
Columbus Die-Tool & Mach. Co. 113
Comtor Company 105
Contract Services Directory 79
Cook's Lead Hammer Service 96
Cooper Weymouth, Inc. 101
Corrosion Reaction Consultants 101
Crucible Steel Co. of America 28

Dake Corp. 108
Danly Machine Specialties, Inc. 9
Dearborn Gage Co. 77, 94, 96
Detroit Testing Machine Co. 98
DeVlieg Microbore Div. DeVlieg Machine Co. 17
Die & Automation, Inc. 114
The DoAll Company 11
Dumore Company 6
Dykem Company 100

Edmund Scientific Co. 95
Eisler Engineering Co. 104
Enco Manufacturing Co. 117
Erickson Tool Company 42
Ex-Cello-O Corp. 15

Federal Press Co. 68
Fellows Gear Shaper Co. 18
Field Tool Supply Co. 117
Firth Sterling, Inc. 81
M. A. Ford Mfg. Co. 95

Gaertner Scientific Corp. 74
Gatco Rotary Bushing Co. 111
General Power Services, Inc. 104
General Tool Div., General Fire Extinguisher Corp. 91
Genesee Manufacturing Co. 99
Gisholt Machine Co. 23
Graphic Systems 112

Haberstump-Harris, Inc. 111
Hardinge Brothers, Inc. 71
Heimann Mfg. Co. 99
Heinrich Tools, Inc. 91
Hovis Screwlock Co. 100
Huebner Publications, Inc. 87, 95, 107, 115, 116
Wm. T. Hutchinson Co. 108

Ideal Industries, Inc. 98
Industrial Tectonics, Inc. 95
Ingersoll Milling Machine Co. 32

Jergens Tool Specialty Co. 91
C. E. Johansson Gage Co. 79
Jones & Lamson Machine Co. 59, 61, 63, 65

Kennametal, Inc. 41
Kidde Precision Tool Corp. 94

Lassy Tool Co. 99
Latrobe Steel Co. 20
Lempco Industrial, Inc. 80
Lepel High Frequency Labs. 111
Linderme Engrg. & Service 96

Mahr Gage Co. 103
Meier Brass & Aluminum Co. 14
W. F. Meyers Co., Inc. 107
Micrometrical Mfg. Co. 16
The Minster Machine Co. 30
Mohawk Tools, Inc. 44
Moore Special Tool Co. 25

Karl A. Neise 106
Niagara Machine & Tool Works 40
Northwestern Tools, Inc. 96

Ohio Knife Co. 85
O'Neil-Irwin Mfg. Co. 10
Optical Gaging Products, Inc. 38

Pipe Machinery Co. 31
Porter Precision Products 97
Prebco Bushing Co. 104
Precision Tool & Mfg. Co. 103
Procunier Safety Chuck Co. 109
Producto Machine Co. 106

Reid Tool Supply Co. 79
J. A. Richards Co. 96
Rockford Engineered Prods. Co. 105
Rockwin Mfg. Co. 117
Rodgers Hydraulic, Inc. 74
Rotor Tool Company 33
Rust-Lick, Inc. 99

S & E Machine Products, Inc. 83
Sales Service Mfg. Co. 79, 94, 104
Scherr-Tumico Co. 115
Geo. T. Schmidt, Inc. 88
Scully-Jones and Co. 117
Service Machine Co. 115
The Sheffield Corporation 76
Shell Chemical Corp. 39
Shore Instrument & Mfg. Co. 94

Standard Tool Co. 110
Star Stainless Screw Co. 106
Superior Steel Products Corp. 3
Sutton Tool Company 2

Thor Power Tool Co. 26
Thriftmaster Products Corp. 29
Titan Tool Supply Co. 97
Tomco, Inc. 114
Tomkins-Johnson Co. 28
Tool Components Co. 99
Twentieth Century Mfg. Co. 96

United States Diamond Wheel Co. 4
Universal Engineering Co. 27

Vascoloy-Ramet Corp. 5
Vernon Devices, Inc. 109
Vidmar, Inc., Div. Volkert Stampings, Inc. 7
Vulcan Tool Company 83

Wales-Strippit, Inc. 12
Walls Sales Corp. 83
Watts Brothers Tool Co. 94
Weldon Tool Company 22
Wells Manufacturing Co. 107
Wespo Div. of Vlier Engrg. Corp. 35
S. B. Whistler & Sons, Inc. 109
Wilton Tool Mfg. Co., Inc. 110
Woodson Tool Company 74

The Yoder Company 97

Zagar, Inc. 107

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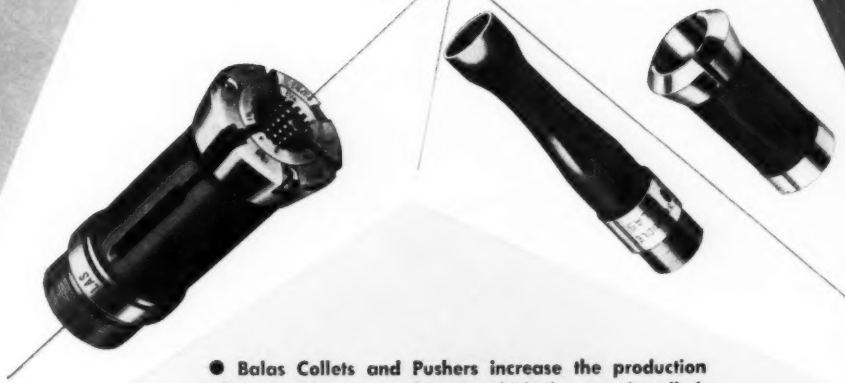

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